University of South-Eastern Norway

Transitioning to a New Horizon: Exploring the drivers, barriers, and success factors for Norwegian Offshore service vessel firms' transition from Oil and Gas to the Offshore Wind Industry

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Abstract

The Norwegian offshore service vessel (OSV) sector is playing a major role in the oil and gas industry. But the climate changes and the consequences is demanding for more sustainable energy sources the world can rely on. This has in recent years, led to growing awareness of the need for sustainable business practices, and offshore wind industry have emerged an alternative sustainable energy source. An industry that present new opportunities for the Norwegian offshore service vessel firms in order to transit from carbon intensive oil and gas industry to a low emission and sustainable offshore wind industry.

Some of the Norwegian OSV firms have already started their transition into the new industry while the majority is still lacking behind. Therefore this study aim to explore and identify the factors that affect the transition of Norwegian OSV firms from Oil and gas industry to Offshore wind industry. In particular, the transition drivers, barrier and success factors was explored by interviewing 6 industry experts.

The findings resulted in identifying four drivers, seven barriers, and eight success factors that need to be considered for a successful transition. The study reveals that the foremost drivers for transitioning Norwegian OSV firms to the offshore wind industry are economical, while the primary barriers are fiduciary duty, low time charter rates and margins, high investment costs, high credit barriers, O&G barriers, technical barriers, lack of political support, and project scale. The success factors for OSV firms in this transition are having a clear and narrative vision, strong firm capabilities, collaboration, innovation, sustainable business models, communication, political support, project scale.

The study contributes to the existing body of knowledge in the field of transition management and sustainability in the Norwegian OSV segment, and it provides valuable insights for OSV firms navigating the transition to the offshore wind industry. Future studies may explore the interconnections and the impact of these factors on the transition of Norwegian OSV firms

Keywords

Norwegian offshore shipping, OSV, offshore wind, business transition, transition drivers, transition barriers, transition success factors

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Abbreviations

- **OSV:** Offshore service vessel/ offshore shipping company
- **OWP:** Offshore wind power
- **O&G:** Oil and gas
- **WTIV:** Wind turbine installation vessels
- **SOV:** Service operation vessel
- **CSOV:** Construction support operation vessel
- **ROV:** Remotely operated vehicles
- **HVL:** Heavy lift vessel
- **HTL:** Heavy transport vessel
- **AHTV:** Anchor handling tug vessel
- **MSV:** multipurpose support vessel
- **CLV:** Cable laying vessel
- **PLV:** Pipelaying vessel
- **GW:** Gigawatt

1.0 Introduction

Norway's offshore service vessel segment (OSV) has played a significant role in the country's economy for many years, primarily serving in the oil and gas industry (Basso, et al., 2022., p. 30). The Norwegian OSV companies *are* owners and operators of specialized vessels to support offshore markets and activities like Oil and Gas, Patrolling, Research and surveys and other offshore related activities, as well as underwater activities. The main type of vessel in the OSV segment is a seismic vessel, construction vessel, supply vessel, anchor handling vessel, and other offshore-related special vessels, such as cable layers and diving support vessels (Dokkum, 2003, p. 59; Jakobsen & Espelien, 2011, p. 4). The Norwegian OSV segment have developed advanced technological capabilities and expertise in operating in harsh environments, which has made Norwegian Offshore service vessel companies highly competitive globally (Borch & Solesvik, 2015; Jakobsen & Espelien, 2011, p. 4).

In recent years, there has been a growing awareness of the need for sustainable business practices, particularly in the energy sector. Regulatory pressure such as the Paris Agreement which is legally binding international treaty, and regulatory bodies such as EU and UN have is now forcing all businesses, including Norwegian OSV segment to reduce their activities in carbon intensive business areas(Bidmon & Knab, 2018; Nations, 2015). Such macro-level measures from regulatory bodies have led to momentum in alternative energy sources to Oil and gas. One such business area that has expanded considerably in recent years is offshore wind (Govindan, 2023; Koh & Ng, 2016, pp. 1–3). This industry is presenting an alternative business area for Norwegian OSV companies(Eivind et al., 2020, pp. 6-7,47-49; Govindan, 2023).

The OSV firms are essential actors that plays a significant role in developing the offshore wind industry as their services are pivotal in all phases of offshore wind farm projects, from exploration, installation, maintenance and decommissioning(Kolakowski & Rutkowski, 2022). Therefore, a transition of OSV firms from Oil and Gas to offshore wind is crucial to achieving sustainable energy goals. A transition is a disruptive change from one socio-system to another system, which can happen on different level of a sociotechnical system. The offshore wind industry rapidly expands and presents a significant growth opportunity for OSV companies. The knowledge and expertise developed in the O&G industry are highly transferable to the offshore wind industry, and Norwegian Offshore service vessel companies are well-positioned

to take advantage of this opportunity. Although, a transition from O&G to offshore wind will not be without challenges. A transition is a long-term process which need to be managed carefully because of the complexity of changing a company's core value creation from one value chain to another(Andreassen et al., 2021, pp. 21–25; Kolakowski & Rutkowski, 2022, p. 383; Norwegian Shipowners' Association, 2022).

Despite the emergence of some Norwegian OSV frontrunners transitioning to the offshore wind industry(Bergek et al., 2021; *DOF Subsea*, n.d.; *Renewables - Siem Offshore*, n.d.; *Solstad Renewable*, n.d.; *Subsea 7*, n.d.), a majority of firms remain behind. Even new companies have been stablished by collaboration between two or more companies, for example WIndstaller Alliance and Edda wind. Additionally, Afewerki et al., (2019) is reporting that out of 97 participated Norwegian maritime firms in their research, only 13 have their core business in offshore wind. This highlights that such a transition is affected by some factors. Furthermore, there is a gap in understanding the factors that affect the transition of Norwegian OSV firms from the oil and gas industry to offshore wind.

While some studies have examined transition factors for several other industries, there is still a lack of empirical evidence on the drivers, barriers, and success factors that impact this transition of Norwegian offshore service vessel firms. Therefore, this study will investigate the factors that affect the transition of Norwegian OSV firms from oil and gas to offshore wind and provide empirical evidence to fill this research gap.

After conducting a literature search on the Norwegian OSV segment and OSV segment in general, it was found that much of the current research focuses on vessel logistics in offshore wind. Asgarpour, (2016), Endrerud et al. (2014), Guo et al. (2022), Kaiser & Snyder (2012) Lerche et al. (2022) Paterson et al. (2018), Spielmann et al. (2021) Tusar & Sarker (2023) discuss the logistical challenges faced by offshore service vessels in the offshore wind industry. On the other hand, Gaidai et al. (2020) Igba et al. (2014), Markus et al. (2013) and Okoro et al. (2021) focus on the engineering and technical aspects of offshore wind, with little emphasis on the involvement of OSVs.

Additionally, some research has been conducted on the transition of maritime industries, including adopting low-carbon and zero-emission fuel solutions by OSV firms in their ships (Bach et al., 2020; Bergek et al., 2021; Pettit et al., 2018; Stalmokaitė & Yliskylä-Peuralahti, 2019). While two other Norwegian studies have contributed to the field of sustainable business

model for Norwegian OSV firms, but these studies do not focus on the transition from one industry to another.

None of the above-mentioned researches have dealt with transition of OSVs from one business area to another. To the best of my knowledge the factors that affect the transition of OSV has either been included in transition management research. This paper identifies the research gap on OSV firms' transition to offshore wind and highlights the need for further exploration and investigation.

The research question will be operationalized by focusing on the transition of Norwegian OSV segment because the firms are in different state in the transition phase. The research question is formulating the factors into transition driver, transition barriers and transition success factors, in order to differentiate the influencing factors. The presenting research will contribute to identifying the drivers, barriers, and success factors for the transition of Norwegian offshore service vessel companies from oil and gas to offshore wind. The research question for this thesis is formulated in chapter 1.2.

1.1 Research question

What are the drivers, barriers and success factors for Norwegian Offshore service vessel companies in their transition from oil and gas industry to the offshore wind industry?

This research question aims to investigate the factors that affect the transition of Norwegian offshore service vessel companies from the oil and gas industry to the offshore wind industry. The question seeks to identify the drivers, which are factors that motivate or facilitate the transition; the barriers, which are factors that hinder or impede the transition; and the success factors, which are factors that will determine the successful transition. This research will contribute to filling the gap in empirical studies on transition that Offshore service vessel companies faces to reach decarbonization goals through the sustainable business areas: offshore wind industry.

1.2 Purpose and contribution of the study

The findings of this study will contribute to the academic literature on transition management and sustainability in the Norwegian offshore service vessel segment. Additionally, the results of this study will provide valuable insights to Norwegian OSV companies as they navigate through the transition from the oil and gas industry to the offshore wind industry. Specifically, the study will help these companies make rational and strategic decisions regarding their business operations and investments in the offshore wind energy sector.

Overall, this study has significant implications for the sustainability of the OSV segment in Norway, as it explores the potential for OSV companies to adapt to the changing market conditions and contribute to the development of a more sustainable energy system.

1.3 Paper structure

The Chapter 1 with introduction is followed by Chapter 2 which is theory section which presents the theoretical framework and OSV segment and Offshore wind industry. The third chapter will explore in-depth the key components in the research question in existing literature. Chapter 4 is a methodology section that will describe the qualitative research design and approaches used to build the presenting research. Chapter 5 of this paper present the results from the data collection. And Chapter 6 will discuss and answer the research question before drawing a conclusion in chapter 7.

2. Theoretical framework

This section will provide a theoretical framework for understanding what transition is in business science and an introduction to how transition will be viewed throughout this research paper. Norwegian OSV firms and Offshore wind industry will be incorporated into the presenting framework in order to understand the factors that affect OSV firms' movement from Oil and gas- to Offshore wind industry.

2.1 Norwegian OSV firms transition to Offshore wind industry in a multilevel perspective

Transition can be defined as nonlinear and disruptive long-term paradigm shift from one equilibrium to another of a socio-technical system, where transition management practices can be used to governance the changes on three different levels of the system. This model is called the multilevel perspective and is widely accepted and used by researchers (Geels, 2002; Loorbach & Wijsman, 2013).

These three levels are namely niche, regime and landscape. Niche refers to a micro-level perspective of a system where firms develops of new technologies, practices, and business models that challenge the dominant regime. In the case of the Norwegian OSV firms, the emergence of the offshore wind industry represents a new niche that offers new opportunities for innovation and growth. By examining the technological and organizational innovations that are driving the offshore wind industry, one can identify the potential of this niche to challenge the oil and gas regime. In other words, this perspective can help to find potential driver for Norwegian OSV firms transition to Offshore wind (Hernández-Chea et al., 2021).

This second level is characterized by a dominant culture, institutional practices, technological and cultural structures. For example, oil and gas regime has been dominant for several decades, and its institutional, technological, and cultural characteristics have been well established. By analyzing the factors that have maintained the oil and gas regime in the face of the emerging offshore wind regime, one can identify the barrier Norwegian OSV firms will face because of established regime of Oil and gas. This can indicate lock-in factors, structural stability factors and more. Such a view of transition will also help to identify the factors for success of a transition from one regime to another(Bidmon & Knab, 2018; Mäkitie et al., 2019).

The last level, landscape focus on the broader aspects of a system where niche and regime is embedded under it. For example political trends, climate changes, paradigms, global challenges are factors that will decide the overall landscape of a society. In the case of the Norwegian

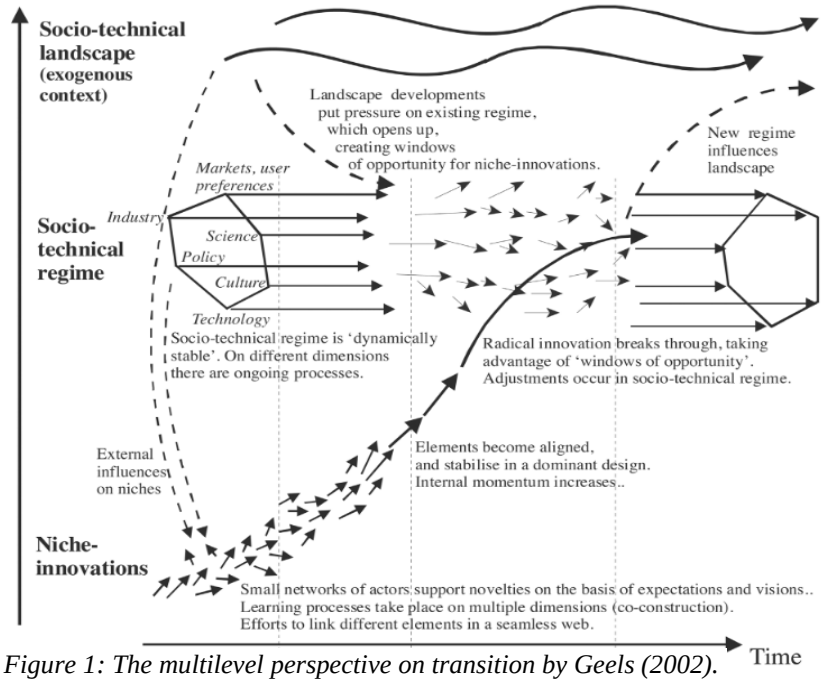

Figure 1: The multilevel perspective on transition by Geels (2002).

OSV firms, the landscape is characterized by increasing pressure to reduce greenhouse gas emissions and shift towards renewable energy sources. This broader context creates opportunities for Norwegian OSV in the emergence of the offshore wind regime and may help to drive its growth and adoption. But the limiting factors from landscape level can also be identified(Geels, 2011; Hernández-Chea et al., 2021).

According to Geels (2002) a sociotechnical system will be a dynamic picture where the influences to transition will be coming from Socio-technical landscapes, Socio-technical regime, and Niche level. Geels multilevel perspective model as shown in Figure 2 is presenting the sociotechnical system in a matrix where transition will roll out over time and all sociotechnical levels will influence a transition in the system.

The Multilevel perspective framework will help understand where the drivers, barriers comes from and what kind of factors facilitated a successful transition. According to this model presenting research is looking for the mentioned factor that influence transition of a niche

(Norwegian OSV firms) from one regime (O&G) to another regime (Offshore wind industry). The next heading will provide an overview of the Norwegian OSV niche.

3. Literature review

As presented in the introduction the research question of this studies is to address drivers, barrier and success factors for Norwegian OSV firms' transition from Oil and gas industry to Offshore wind industry. Thus, this chapter will provide an overview of the current state of the Norwegian OSV segment and its services, before reviewing Offshore wind industry current state. Thereafter reviewing literatures to identify drivers, barriers and success factors for Norwegian OSV firms transition to Offshore wind industry. This section will review previous studies in order to understand the current state of the topic and to provide a framework for this studies data collection, analysis and interpretation. The findings on transition drivers, barrier and success factors will be organized in a table in the summary section of the literature review chapter.

There is lack of empirical studies on drivers, barriers and success factors for business transition of Offshore service vessel firm and maritime industry in general limits access to accurate factors. Munim et al. (2020) and Parola et al. (2021) are among the studies that address the gap in literatures on digital ***transformation (niche innovation)***, which is an important part of nice actors' steps towards the transition. These statements in the recent studies indicate the lack of focus on transition areas for Maritime cluster, including OSV firms. Therefore, the objective of this research is to provide a better understanding of the existing knowledge on the subject and highlight the gaps in empirical studies on presenting topic, and at the same time, provide a foundation for the research of this thesis.

Because of the gap, the literature search process will therefore not only review studies on the OSV and OWP, but the search process will be extended to other industries, for example among others O&G industry other maritime segments. Identified the key concept of the research question through literature review will help to evaluate the relevance and validity through primary data collection.

3.1 Review of the Offshore service vessel segment

The offshore service vessel firms are the owners and operators of specialized vessels to support markets and activities like Oil and Gas, Patrolling, Research and surveys and other offshore related activities, as well as underwater activities. The main type of vessel in the OSV segment is a seismic vessel, construction vessel, supply vessel, anchor handling vessel, and other offshore-related special vessels, such as cable layers and diving support vessels (Dokkum, 2003, p. 59; Jakobsen & Espelien, 2011, p. 4).

The Norwegian offshore service vessel industry has been developed since early 1970 and has gained a leading position worldwide. The industry has played a significant role in Norway's offshore energy sector and provided high-quality services to build and maintain the oil and gas regime(Jakobsen & Espelien, 2011, p. 4). However the industry has faced challenges recently due to the 2014-2016 oil crises, political uncertainty, and changing user demands. It has therefore been affected by an oversupply of vessels and depressed market conditions, where the turnover of the OSV industry in 2022 was 56 billion NOK, almost half of what it was in 2014 (Norwegian Shipowners' Association, 2022, p. 8). However, the market has gained momentum and has started to heal, according to the data from Clarkson shipping intelligent network (*Clarkson Shipping Intelligent Weekly*, 2023)

The Norwegian offshore service vessel industry provides various services such as inspection, exploration, operation, maintenance and repair, transportation of personnel and equipment, and supply to offshore mobile unit support, among others. There are about 500 vessels controlled by around 50 offshore shipping companies in Norway (Jakobsen & Espelien, 2011, p. 6; *Vessel Type by Clarkson*, 2023). The Norwegian OSV firms have specialized in different areas to provide service to the offshore O&G industry. These services are transferable to OWP industry and present services from in exploration of new sites, geological analysis, cable laying and subsea operations, installation, maintenance and operation, and decommissioning of offshore wind farms (Andreassen et al., 2021, p. 9; Kolakowski & Rutkowski, 2022, p. 383).

3.1.1 Services area and vessel type of Norwegian OSV firms

As mentioned above the Norwegian OSV firms provide different type of services with required vessels which also vary. This niche have been dominated by the O&G industry regime structures and have consequently diversified and specialize in different services with different vessel types to serve this industry. Norwegian OSV firms can be distinguished by these operational areas.

The first group of firms are called Seismic firms and uses only one type of ships: seismic ships. Seismic companies specialize in gathering data about geological formations beneath the seabed using seismic exploration technology. Seismic companies then sell this information to exploration and production drilling companies, who use it to identify potential oil and gas reserves and decide where to (Dokkum, 2003, p. 61; Jakobsen & Espelien, 2011, pp. 14–17).

In the exploration- and production drilling phase will the incumbents such as Equinor, Asker BP, Vår Energy charter offshore vessels form OSV companies. Exploration and drilling phase belongs to the oil and gas extractor, but several offshore vessels with different objectives are charter to support this phase.

One of the companies involved in exploration, development, and production is the heavy cargo transportation firm. This type of firm specializes in vessels equipped with the necessary equipment and services to transport heavy cargoes, such as rigs, subparts, accommodation platforms and platforms to construction site. These firms have the vessels and knowledge to handle lifting and installation operation of these heavy cargoes. Typically, these vessels are semi-submersible in design, and are also involved in the decommissioning phase of offshore (Dokkum, 2003, pp. 62–63).

Other active actors in this phase is subsea companies who operates highly specialized subsea ships with advanced equipment to provide services such as installation, maintenance and repair of underwater equipment and facilities in the oil and gas industry. This can include everything from subsea pipelines and cables to subsea technology for production and inspection. The vessels can also be specialized in different areas, for example cable laying ships, DSV ships are differently built. But some can have integrated functions inbuilt. These companies uses subsea ships with advance technology to conduct underwater operations in the oil and gas (Jakobsen & Espelien, 2011, pp. 11–12).

Operators of offshore supply ships are another type of OSV actors who are active in every phases of oil and gas activity. These firms uses different type of support ships, such as PSV, AHTS, MSV and specialized crew ships to support the O&G companies with supply of cargoes, equipment, transport of personnel to and from the platforms. Operators of support vessels can be specialized firms who provide only these services, or it can also be firms who provides different types of offshore services with different vessels. For example, Havila shipping have AHTS, PSV and subsea ships in their fleet(Dokkum, 2003, pp. 66–67; *Havila Shipping ASA • Havila Shipping ASA*, n.d.; Jakobsen & Espelien, 2011, pp. 7–8).

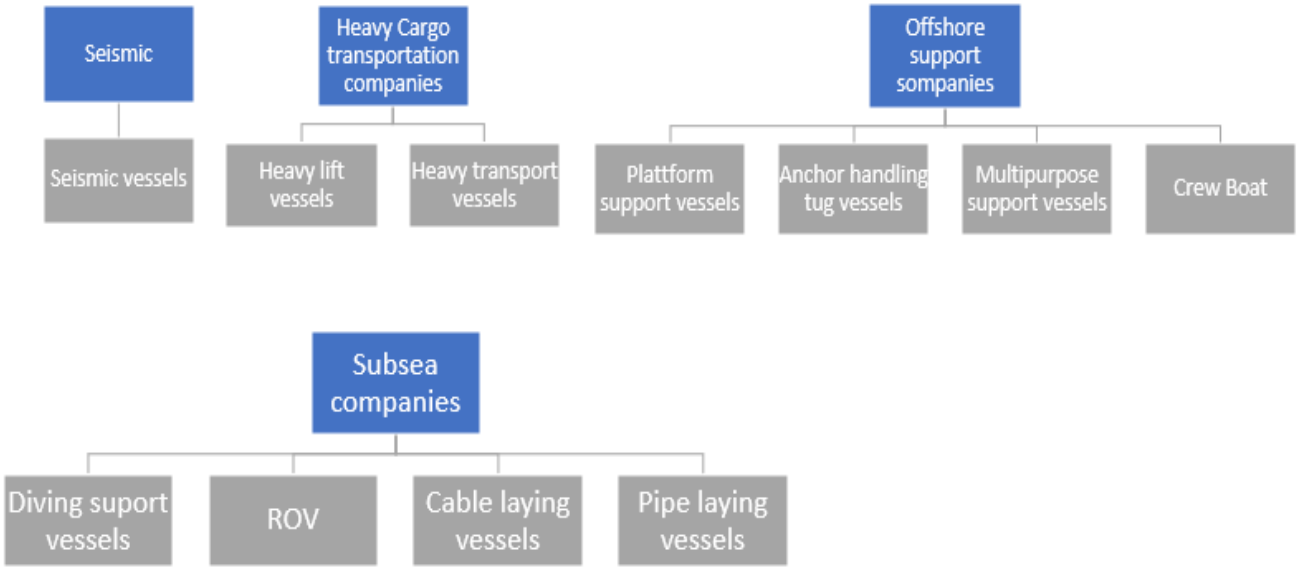

Figure 2: The figure illustrate the different Norwegian OSV firms and the vessels they uses for value creation (Dokkum, 2003, pp. 60–67)

There are many types of OSV companies in Norway who are either specialized in one business domain and have one type of vessels to take part in the O&G industry value chain, and those who have diversified their portfolio and provides integrated services within many business areas with different type of vessels. However the Norwegian OSV niche actors can be differentiated by four main business areas. These areas are Seismic, Heavy cargo transportation companies, subsea companies and offshore support companies. The figure below shows the different types of ship they uses.

3.2 Review of the Offshore wind industry

The offshore wind energy is a clean and renewable energy source that can be captured by using wind turbines at high seas where the wind is constant and more forceful than onshore because there are no barriers to reduce the force of the wind(CORPORATIVA, n.d.)

The latest offshore wind turbines are capable of producing up to 9.5 GW of electricity(*Wind Energy – Going Offshore*, n.d.). However, these turbines vary in size and dimension, with current models having a rotor diameter of 158 meters and 220-meter blades currently under construction. Hub heights of approximately 100 meters are common, and the turbines themselves weigh more than 200 metric tons (Palmer, 2021). These dimensions are subject to change depending on the turbine type and installation location (Palmer, 2021). The turbines are megastructures continuously being developed in size and capacity to harness the most energy possible, increasing the demand for high-quality and specialized maritime services from OSV companies.

Globally, the total installed offshore wind capacity is 60 GW, with China accounting for 47% of the total capacity. In 2021, a record 21.1 GW of offshore wind power capacity was installed, a threefold increase from the previous year (Fernández, 2023; Williams et al., 2022). According to Fernández (2023) and Williams et al. (2022), there has been an average yearly growth of 36% in offshore wind capacity globally. Williams et al. (2022) forecast that the total installed offshore wind capacity will reach 370 GW by 2031, which means that the market will continue

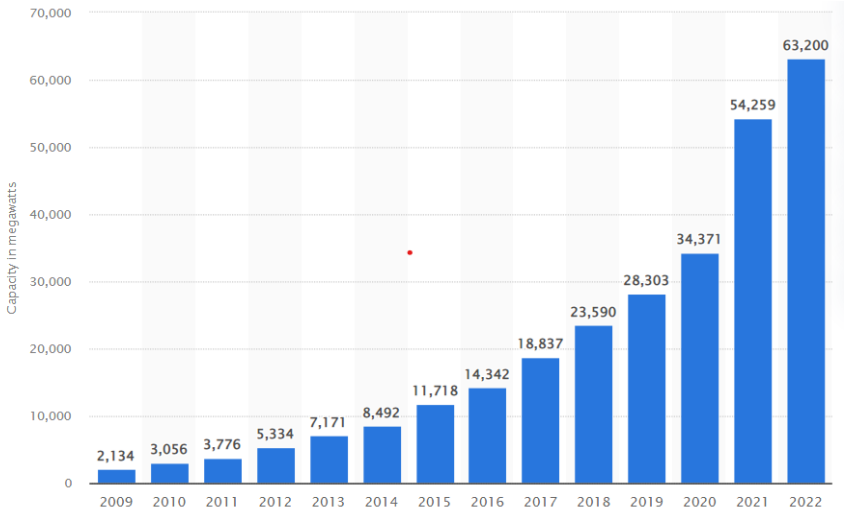

Figure 3: The chart by Fernández (2023) shows total global offshore wind capacity till year 2022. According to Fernández (2023) in 2022 did the total capacity exceeded GW.

growing 21.26% per year till 2031. This numbers is indicating a significant market opportunity for Norwegian offshore service vessel (OSV) firms in the years ahead.

According to the European Environmental Agency, offshore wind farms' most active and important areas are the North Seas, Baltic Sea, Celtic Sea, Norwegian Sea, and Kattegat (Andreassen et al., 2021; *European Environment Agency*, 2022, p. 7). However, since the market is expanding in Asia and America, these areas present significant business opportunities for Norwegian OSV firms. To grab these market opportunities, OSV firms must meet the technical vessel requirements in the Offshore wind regime, which vary from the O&G regime.

3.2.1 Vessel requirements in OWP

As stated by American Clean Power the development of offshore wind farms need on average 25 vessels, including seafloor survey work, component transfer, cable laying, crew transfer, and turbine(ACP, n.d.). The requirements for vessels used in the offshore wind industry are unique and different from those used in the oil and gas industry. As such, not all existing offshore service vessels are suitable for use in the offshore wind industry (Palmer, 2021).

The offshore wind industry is preferring purpose-built vessels that are compliant with industrial requirements (Börner, 2022). The key technical requirements for vessels used in the offshore wind industry is the ability to carry out operations, transport equipment and personnel, and accommodate personnel safely and efficiently to and from offshore windfarm locations (ACP, n.d.). The location of windfarms are mostly located in areas where the wind is strong which also means the waves and offshore weather is harsh (Midttun, 2020).

OSVs used in the oil and gas industry may therefore not be efficient and safe enough to handle the strong winds, high waves, and severe in weather conditions that can be encountered in offshore wind projects. Equipment such as cranes, gangways, jackup legs, dynamic positioning and heave compensation systems are some of the critical components that vessels in offshore wind need(*Ocean Energy Resources | 4 2022*, 2022). Ulstein yard which is one of world's leading yards that builds purpose-built vessels for offshore wind industry is categorizing these vessels in different categorizes based on their capabilities purposes.

The first one is **Offshore wind support vessels**, which **includes Service operation vessels (SOV), construction support vessels (CSOV)** and **Installation support vessels (ISV)**. These vessels are built to provide efficient support services under different stages of an offshore wind project. Are for example equipped with gangways, optimal fuel consumption solution,

integrated accommodation solution, cranes and sophisticated dynamic position systems since the vessels might need to be on the sea for many days(Ulstein, n.d.). Second type I cable laying vessels (CLV) which is similar to the vessels used in O&G operations, but the cables for offshore wind turbines are bigger and heavier, compared to the cables in O&G (Börner, 2022; Ulstein, n.d.).

The third type of vessel is called **Subsea rock installation vessels**, which is designed to build and protect the subsea infrastructures conduction analysis of the subsea with ROVs and laying rocks. The vessels has various equipment such as cargo hold, gears and belts to handle the cargo. The fourth category of vessels are Offshore wind feeders, which is built to transport wind turbine components to installation vessels(*Subsea Rock Installation Vessels*, n.d.)

Another type is **Foundation installation vessels (FIV)** which are specialized offshore wind-industry ships to install foundation structures. It features offshore crane, a pre-piling template at the stern, and can carry jackets, piles, and turbine components. This type of vessel is also submersible and designed with advanced dynamic positioning systems and with propellers and fuel solutions to reduce environmental footprint(*Foundation Installation Vessels*, n.d.).

The last type of purpose-built vessels for Offshore wind industry is **Wind turbine installation vessels (WTIV)**. These are built to install the wind turbines and are built with jack-up legs that can lift the vessel above sea-level in order to operate regardless of the wave's activity. The cranes are also meat to lift heavy cargo such as the blades, turbine hub, and other heavy (*Jack-up Heavy Lift Vessels*, n.d.; Paterson et al., 2018, pp. 640–642).

The OWP charterers categorizes the current OSVs accordingly to which degree they meet the technical requirements of OSV industry. The vessels can be divided into three categories, Tier 1, Tiers 2 and Tier 3. Tier 1 vessels are according to Clarkson the purpose-built vessels that are preferred by charterers in OWP. Tier 2 vessels are the vessels they will research out if there is lack of Tier 1 vessels. These vessels originally served O&G industry but have later been retrofitted and modified with necessary equipment to meet the requirements of OWP companies. The last class is Tier 3 vessels which rents the equipment such as cranes and gangways to work in offshore wind projects. These vessels are the last option for Offshore wind charterers (Börner, 2022; *Service Operation Vessel Upgrad*, 2023). The next sub-chapter will conduct a literature review and present how the vessel demand- and supply in Offshore wind industry can drive Norwegian OSV firms transition towards this industry.

3.3 Transition drivers

The **lack of vessels** necessary for operating and maintaining wind farms, as noted by Kolakowski and Rutkowski (2022), presents a significant factor to consider when examining OSV firms' transition to the offshore wind industry. This finding offers valuable insight. A report from the Polish Wind Energy Association have come to the same conclusion (PWEA, 2022). According to this report, even if there is an oversupply of offshore vessels, most of them does not meet the technical requirements from offshore wind industry. The forecasts from PWEA (2022) and also Börner (2022) based on available vessels, orderbooks and planned offshore wind projects shows that there will be lack of vessels for offshore wind. The lack of vessels can indicate that there is a barrier that prevents OSV firms from investing in vessels to use in offshore wind. On the other hand, this finding shows that this can be a driver for current offshore service vessel companies to use the market gap as an opportunity to invest in such assets to gain market share in the renewable energy industry.

Another driver for the transition of Norwegian OSV firms to offshore wind is the **increasing freight rate** for offshore wind vessels. Increasing rates can attract the stakeholder to enter the market to increase company revenue. Clarkson reported a y-o-y fright rate growth of 30% for W2W vessels, while Edda Wind who operates both SOV and CSOV, has reported an increase in the daily rate of 21 % since IPO in the second half of 2021 (Edda Wind Company Presentation, 2023; Gordon, 2023). Market analysis by Börner (2022) show that there has been consistent growth in the CSOV segment since 2016. However, the reports do not account for the fact that freight rates can be influenced by unpredictable and exogenous factors that may cause declining rates. Despite this, companies are not deterred by the market's increasing freight rates, which presents an excellent opportunity for Norwegian OSV firms to expand their business into offshore wind.

Offshore wind is one of the sustainable energy sources that can help fight the current global greenhouse gas emissions. It has gradually gained attention in **political arenas and new supportive polices have** enabled the development of offshore windfarms in around the globe in an exponential speed. Development of supportive polices for offshore wind and renewable energy is driving the OWP market forward. In the past two decades have many scholar studied the topic (Jenkins et al., 2022; Kern et al., 2014; Normann, 2015; Polzin et al., 2015; Roux et al., 2022; Varela-Vázquez et al., 2019). Two of the studies reveals that insufficient political decisions and underdeveloped policies led Norway and Ireland to face failure in their attempt

to develop offshore wind (Normann, 2015; Roux et al., 2022). Thereby underlying the importance of political support for realizing such ambitions.

However the situation have changed as the climate changes are more evident and the technological maturity of renewables are improving rapidly. EU have for example launched policies to increase the development of renewable energy. Political engagement and initiation of supportive policies for renewables is driving the transition forward (Jenkins et al., 2022). Jenkins et al. (2022) exploratory scenario-based study on major drivers for Offshore wind in Finland reveals that three out of four scenarios indicates Political alignment and supportive policies as major driving forces for offshore wind power development. Normann, (2015) Roux et al. (2022 corroborates the findings of this study as well.

Another analysis for implantation of offshore wind energy is arguing that deployment of this new industry will be dependent on policy and also market driving factors (Varela-Vázquez et al., 2019). In that connection, EUs new measure, Carbon Border Adjustment Mechanism (CBAM) is such a market driven factor that will force industries to switch to renewables and open new opportunities for offshore wind as well (Carbon Border Adjustment Mechanism, n.d.)

The increasing political alignment and supportive policies for renewable energy sources are one of the driving factors for further development of offshore wind industry, which lead to better market conditions and stable opportunities for Norwegian OSV firms. As previously mentioned, some Norwegian OSV firms have advanced further than others in transitioning to the offshore wind industry. This discrepancy in the level of involvement in the indicates presence of potential barriers hindering the transition process. Accordingly, the following sub-chapter will delve into the existing literature to investigate the potential barriers from previous studies.

3.4 Transition barriers

The ongoing paradigm shift to sustainability has increased scholars' focus on Transition management. Consequently, the research on niche actors in the energy sector has also been documented in recent years as individual companies plays a crucial role in sustainability transition. This section will investigate the barriers OSV companies might faces in their transition to offshore wind. Literature search reveals that barriers to transition for OSV firms have not gained the attention in research. Therefore will this part extend the search area and look for potential barriers from other industries that is transferable to OSV segment. Segments such as shipping-, offshore wind- and oil and gas industry helps to identify potential barriers from literatures. Relatable topics to transition such as digital transformation is also included in this part.

The case study conducted by Mäkitie et.al (2019) is that **short-term profitability** plays a significant role in the transition of O&G companies to the Offshore wind industry. The firms are all concerned with value-creation in the short term and consequently delay the transition to renewable business areas. The study of Sharma et al. (2023) and Sletten et al. (2023) discuss short-term profitability as an organizational barrier to business transition for O&G companies. High profitability for oil and gas compared to offshore wind is influencing the actor's willingness to change (Sletten et al., 2023). Thus, this can be perceived as a barrier to the transition of Norwegian OSV companies towards the offshore wind as well. This barrier in combination with high investment cost is constraining transition to sustainable businesses.

High investment cost in new technologies, resources and organizational process is considered as an important barrier that hamper the transition to sustainable business (Sharma et al., 2023, p. 9; Shojaeddini et al., 2019, p. 14) . Offshore vessels and equipment for OSV firms are highly capital-intensive assets, and to invest in these in order to meet new technical requirements from offshore wind industry can have a negative effect on companies. Investing in new technologies is considered to be a speed breaker for OSV firms, since they have suffered many years of low revenue and high number of vessels in lay-up because of oil crisis in 2016 and Covid-19 (Hessevik, 2022).

Blincoe (2022) findings presented in her book indicates that firms are obliged to generate financial wealth (Short-term profitability) for their stakeholders, that makes it complicated and difficult for them to align the stakeholders in sustainability goals. The analysis performed by Sharma and colleagues reveals the same barrier and further concludes that the most influential barrier on Oil and gas actors' transition is the financial barrier. Their research does also further address barrier which is lack of knowledge and skills (Sharma et al., 2023).

As previously mentioned ***Lack of knowledge and skills*** have been identified as a substantial transition, transformation and change barrier in many studies (Lu et al., 2019; Poulsen et al., 2017; Raza et al., 2023; Sharma et al., 2023). This factor is therefore a substantial barrier that hamper transition of firms. According to some studies the lack of skills and knowledge is a significant challenge for succeeding with business transition. The studies outlines that knowledge and personnel skills in the transiting business area are lacking for for example O&G companies and appears to be a major constrain for their transition sustainable practices (Lu et al., 2019; Sharma et al., 2023).

Raza et al. (2023) research is consistent with the research conducted by Pagano et al. (2022) where one of the salient point from the finding was that maritime companies struggled with insufficient technical knowledge and skills which impede the transformation to digital practices in shipping and logistics. This barrier is worsened by competency traps, where the people who is working are specialized in traditional ways of doing business and lack the potential knowledge and skills to bring change, and also change the business of the company. At the same time, talent acquisition is getting harder as maritime industry is facing great competition from other industries such as banking, telecom and media etc. Interviews conducted by Raza et al. (2023) revealed that shortage of right talents in the market lead to lack of resources for them to envision the change the company desires.

The Offshore logistic firms among other OSV firms in the long-term horizon need to invest in personnel and skills in order to gain competitive advantage in offshore wind industry (Poulsen & Lema, 2017). The common solution many studies have outlined is to develop better collaboration and both closed and open innovation. The researchers point out that such measures will minimize the impact of this barrier in their transition and transformation of businesses (Poulsen & Lema, 2017; Raza et al., 2023; Sharma et al., 2023).

The lack of right knowledge and skills in transition phase is a substantial barrier that can hamper Norwegian OSV firms transition as well. as presented above, this barrier is evident in the research conducted by Lu et al. (2019), Poulsen et al. (2017), Raza et al. (2023), and Sharma et al. (2023), which all point to the lack of knowledge and personnel skills as a significant challenge for businesses transition to sustainable practices.

Since the literature review on transition barriers helped disclose some barriers that can hamper the transition of Norwegian OSV firms, it is also important to investigate how the firms can overcome the barriers they faces. The next section will conduct a literature review on Success factors that can determine a transition.

3.5 Success factors for transition

Business transition requires the identification of success factors that will enable the transition. However, identifying success factors for OSV industry in literature has been difficult because existing literature has not directly discussed the topic, especially it have not been applied on the presenting segment. Existing literature on sustainability transition management employs comprehensive case studies which gives insight into how some actors succeed with the transition. some of these success factors can be generalized and interpreted as success factors to Norwegian OSV companies as well.

A qualitative study based on 14 case studies on critical success factors for transition to sustainable business models is outlining **clear and narrative vision** as one of success factors (Long et al., 2018). A good vision that narrate the transition to sustainable business is needed to create awareness of the company's transition with its employees, stakeholders and costumers. Hernández-Chea et al., (2021) systematic literature review with two case studies discovered that shared vision and strategic dialogues among firms in different sectors as essential to develop value propositions and leverage business opportunities for sustainability in the long run. Kemp et al. (2007) research is older that the Long er al. (2018) and Hernández-Chea et al., (2021), but the finding is supportive, and according to this research a transition is co-evolution of different actors towards a future state, which should have a collective vision in order to navigate and succeed.

One of the literature that can be used to find success factors for business transition is conducted by Gorissen et al. (2016). The article points out that the actual result of transition is highly dependent on the ***capabilities*** in the process (Gorissen et al., 2016). Capabilities refers to a

firm's ability to execute various activities and processes effectively, leveraging its collective knowledge, skills, resources, and systems to achieve its objectives and compete in the marketplace. This can include technological expertise, managerial and leadership capabilities, human resource management practices, and financial resources (Teece et al., 1997).

The research is arguing that transition is a process of learning, and its success is highly determined by the capabilities of people who are involved in managing it. Likewise Loorbach & Wijsman (2013) case study on the German roofing sector demonstrated that a developing new knowledge and competence through mutual learning will facilitate a successful transition from one business practice to another. It is also worth mentioning that researches that focus on capabilities as a success factor is revealing that ***collaboration*** is an important factor as well in the success of sustainability transition.

Van Kleef & Roome (2007) suggests that innovation for sustainability requires the involvement of a diverse network of actors with local knowledge. This shift towards sustainability has implications for the capabilities and competence needed for innovation. The research is showing that innovation and knowledge for sustainable changes is depended on collaborative activities by building networks and multi-actor forums. This finding is also supported by the recent studies that highlights the importance of collaboration.

According to the recent studies collaboration between different actors is a significant factor that enable organization to tab into a transformation of their current state. It opens up trajectories to learn from each other and tab into cross-functional innovations which in turn fuel a successful transition to sustainable businesses (Bag & Rahman, 2021; Gorissen et al., 2016; Loorbach & Wijsman, 2013). Other studies outlines that collaboration and innovation in connection is a determining factors in taking a leading position in a transition process. And that this capabilities together will give the incumbents a strategic position (Magnusson & Werner, 2022). Especially for OSV firms which are in an environment where new trends, increasing operational complexity and requirements of purpose-built vessels- and services affect their competitive advantage and profitability (Borch & Solesvik, 2015).

Other critical factor that can lead to successful transition of OSV to Offshore wind is **sustainable business models** and **innovation.** Even if these are to factors, they are highly dependent on each other's in facilitating a transition (Sletten et al., 2023). A business model that is aligned with the **vision** for sustainable business will facilitate niche innovation, both

non-technological and technology which will help to breakthrough current dominating practices to enter the new regime (Bidmon & Knab, 2018). The business models that have dominated the segment need to be modified or changed according to the new industry and have to be fit to drive the transition of the firm.

According to Sletten et al. (2023) there is no universal business model that applies to all companies or field, but they suggest that the majority of companies will have introduce innovations in various areas such as customer segments, value propositions, key resources, key partners and cost structures to attain successful sustainability transition. This finding is supported by the two studies which is performed on sustainable business models of Norwegian OSV firms (Gjøsæter et al., 2021; Kyvik & Gjøsæter, 2017). The comparative case studies provides evidence that a business model which is aligned with company vision and the core value of the company succeed with not only doing the business but doing better business. In other words the studies demonstrated that a good business model promotes innovation on niche level which can be technological and non-technological. The studies also highlighting that an innovation of new way to do businesses (non-technical innovation) and technological innovation deemed weighted different type of resources.

Borch and Solesvik's (2015) longitudinal case study suggests that adopting open innovation, i.e., collaborating with external partners to develop and share core capabilities, can accelerate the innovation process and result in increased product value. This studies is providing important linkages to the previously explored success factors such as ***capabilities and collaboration***. Although, open- innovation (innovation in collaboration with external actors) gives only the deemed value when the company have strong core competence and then can take it into the collaboration to give value for the innovation projects such as designing and building a costume-tailored vessel (Borch & Solesvik, 2015; Kyvik & Gjøsæter, 2017).

Even if the studies on sustainability transition in other industries have identified several success factors, they may not be directly applicable to the Norwegian OSV and Offshore wind industry. However, by drawing from research on transition management and exploring the OSV segment, and other industries, I have extracted factors that does not only appears to success factors for a transition, but factors that are present a fundament for transition. These factors can therefore be critical success factors for a transition of Norwegian OSV firms.

3.6 Summary of literature review

This chapter have conducted a literature review on the key concepts of the research question in order to provide a better understanding of the existing knowledge on the subject and highlight the gaps in empirical studies on presenting topic, and at the same time, provide a foundation for the research of this thesis. The findings from literature review will be examined for verifying their relevant for this study.

The offshore service vessel segment comprises specialized vessels that support various offshore activities, including oil and gas exploration, research, and underwater operations. Norwegian OSV firms specialize in different services and vessel types to serve the offshore oil and gas industry, including seismic, heavy cargo transportation, subsea, and supply ships. These services are also transferable to the offshore wind power industry. Further, available literature, reports and outlooks on the Offshore wind energy industry indicate a rapidly growing industry, with China currently leading with 47% of the global installed offshore wind capacity of 60 GW. The industry is expected to grow, with an estimated total installed offshore wind capacity of 370 GW by 2031, presenting a significant market opportunity for Norwegian offshore service vessel firms. Purpose-built vessels with unique technical requirements are preferred for the offshore wind industry, and Norwegian OSV firms need to meet these requirements to take advantage of the market opportunities.

The literature review on the drivers for Norwegian offshore service vessel firms' transition toward the offshore wind industry revealed three factors. One factor is the lack of vessels required to operate and maintain wind farms, which presents an opportunity for Norwegian OSV firms. Another driver is the increasing freight rate for offshore wind vessels, which can attract stakeholders to enter the market and expand their business. The literature also highlights the increasing political engagement and supportive policies for renewable energy, which drive offshore wind development and create stable opportunities for Norwegian OSV firms.

The Drivers	Description	Literature
Lack of vessels	The industry experts have predicted shortage in vessels, which can be an driving factor for Norwegian OSV firms to invset into offshore wind industy.	Börner (2022), Kolakowski & Rutkowski (2022) & PWEA (2022).
Increasing freight rate	Increasing fright rates can attract Norwegian OSV firms to develope business in Offshore wind industry	Edda Wind Company Presentation (2023), Gordon (2023), Börner (2022).
Political alignment with supportive policies	Political alignment and supportive policies for renewable energy sources are one of the driving factors for further development of offshore wind industry, which lead to better market conditions and stable opportunities for Norwegian OSV firms.	Jenkins et al. (2022), Kern et al. (2014), Normann (2015), Polzin et al. (2015), Roux et al. (2022), Varela-Vázquez et al. (2019).
The Barriers		
Short-term profitability	Focus and commitment to maximize the proft makes it difficult to invest in long-term sustainable busine	Mäkitie et.al (2019) , Sharma et al. (2023), Sletten et al. (2023).
High investment cost	New technologies, resources and organizational process are capital intensive when it comes to inital investments. High investment cost hamper the transition to sustainable business.	Sharma et al. (2023), Shojaeddini et al. (2019), Hessevik (2022), Blincoe (2022).
Lack of knowledge and skills	Lack of knowledge and skills for involvement in the Offshore wind industry will be an barrier.	Lu et al.(2019), Poulsen & Lema (2017), Raza et al. (2023), Sharma et al.(2023), Pagano et al. (2022).
Success factors		
Clear and narrative vision	A good vision that narrate the transition to sustainable business is needed to create awareness of the company's transition with its employees, stakeholders and costumers	Long et al. (2018), Hernández-Chea et al. (2021), Kemp et al. (2007).
Capabilities	Capabilities of a firm, which is a firms ability to execute various activities and processes effectively, leveraging its collective knowledge, skills, resources, and systems to achieve its objectives and compete in the marketplace is a critical factor for the sucess of the transition.	Gorissen et al. (2016), Teece et al. (1997), Kemp et al. (2007), Loorbach & Wijsman (2013).
Collaboration	Collaboration between different actors is a significant factor that enable organization to tab into a transformation of their current state. It opens up trajectories to learn from each other and tab into cross-functional innovations which in turn fuel a successful transition to sustainable businesses	Van Kleef & Roome (2007), Bag & Rahman (2021), Gorissen et al. (2016) Loorbach & Wijsman (2013), Magnusson & Werner (2022), Borch &
Sustainable business models	Having a sustainable business model that is alinged with the sustainable vision, firms capabilities and a model that supports innovation will be critical for the sucess of a transiton to ffshore wind	Sletten et al. (2023), Bidmon & Knab (2018), Gjøsæter et al. (2021), Kyvik & Gjøsæter (2017)
Innovation	Technological and non-technological innovation is an important sucess factors for transition. Collaboration with external actors and utilization of internal caabilities will be key determinans	

Figure 4: An overview of the main concept that are explored through literature review.

This literature review explores the potential barriers OSV companies face in transitioning to offshore wind as sustainability becomes an increasingly important focus in the industry. The study finds that short-term profitability, high investment costs, and lack of knowledge and skills are all significant barriers that can hinder the transition of OSV firms to sustainable practices. The lack of knowledge and skills is particularly challenging, as it affects personnel and talent acquisition and limits the company's ability to envision change. However, developing better collaboration and closed and open innovation can minimize the impact of these barriers and facilitate the transition of OSV companies to sustainable practices.

Although the literature on success factors for transition is scarce, some success factors identified through previous research from other industries and topics can be generalized and applied to the Norwegian OSV industry. These success factors include having a clear and narrative vision, developing capabilities, collaboration, sustainable business models, and innovation. Success in transitioning depends on the capabilities of people managing the process, and collaboration between different actors is essential. A sustainable business model aligned with the company's vision and core values facilitates niche innovation, both technological and non-technological, which is necessary to achieve successful sustainability transitions.

The literature review has provided a better understanding of the research topic and the relevant concepts for the research question. However, it has also revealed a significant gap in the literature regarding the transition of the maritime industry, particularly in the OSV segment. Although some areas, such as digital transformation and sustainable business models, have received attention in recent empirical studies on the maritime industry and OSV segment, the transition drivers, barriers, and success factors have not been thoroughly researched for either Norwegian OSVs or OSVs in general. Addressing this gap will be the focus of this study, and its contribution to the field will be in providing insights into this topic for the given industry.

The next chapter will delve into the methods that have been used to conduct this study. The literature search and selection process is also explained in more detail in Chapter 4.

4 Method

This section will provide insight into methods used to conduct, analyze and interpret the data that have constituted to study the research problem in this thesis.

Choosing methods to conduct analyze and interpret data will affect the quality, reliability and the relevance of a research. Therefore should the researcher choose an appropriate method for the respective research type. Research method is defined as techniques, tools and procedures that researchers uses to study the research problem (Kothari, 2004, pp. 7–8; Frankfort-Nachmias et al., 2015, pp. 12–13). Choice of methods will depend on the type of research problem. For example, a research question that aims to find the behavior of management group in Norwegian shipping companies will choose an exploratory question with qualitative data collection methods to capture verbal, behavioral and symbolic information. While a research problem that aim to find the economic growth of Norwegian shipping industries will need a quantitative approach which will be based on numbers. The tools and procedures to collect, analyze and interpret the data will therefore be distinct in connection with the research type.

Research methods are critical in order to carry out a systematic research which makes the study legitimacy and at the same time provides a framework for managing the complexity of scientific research (*Indeed, 2022*.). The previous research on similar research problems are valuable supports to identify and apply suitable research methods for ***this thesis***.

Tools used to analyze qualitative data can also be found in research papers and reliable books like ***Business Research Methods*** by Bell et al. (2018) as well. Previous research papers and books was be used to identify tools for data extraction, quality control and synthesis of raw qualitative data.

This section will further explain in detail which research design are used, information about the population and sample to investigate the problem, which data collection and data analysis methods are used before discussing the ethical aspects that have been considered for present paper.

4.1 Addressing challenges for the research

Conducting an in-depth investigation on the chosen academic topic presents several challenges. One primary challenge is the lack of empirical data related to the OSV's transition process, while another obstacle is finding appropriate industry experts willing to participate in an interview due to their busy schedules. Additionally, the time constraint may compromise the quality of the investigation.

To address these challenges, a comprehensive literature search can help bridge the academic gap, and empirical studies on market and business transitions from other industries can provide valuable insights. Potential participants will be contacted directly through phone calls and email to scheduling the meetings, which was used as a method to mitigate the challenge of recruiting appropriate industry experts. To gather rich qualitative data, a semi-structured interview approach will be employed with experts from Norwegian OSV firms and Norwegian Shipowner Association (NSA).

4.2 Research design

A research design will set the foundations to collect and analyze data and indicates what kind of delimitations the research uses and what kind of aspects of a problem it seeks to solve. For example what kind of **themes** and relationship between them are important, to which extend can the interpreted data be generalized (Bell et al., 2018, p. 45).

The research problem of this thesis has an explorative characteristics that seeks to gain more understanding of industry-related challenge. The research question seeks to explore the barriers, driver and success factors to succeed with a transition of Norwegian OSV firms from oil and gas to offshore wind industry. Based on Kothari (2004) work, the research question forms the basis for an applied research where the stakeholder of Norwegian firms can apply the findings in their decision-making process on managerial level.

Literature review on similar research problems, which is presented in chapter 3 indicates that an explorative research like this, in the area of business science have mostly used inductive approaches in exploratory research studies. The research of Gorissen et al. (2016), Löhr & Mattes (2022) Loorbach & Wijsman (2013), Magnusson & Werner (2022) and Mäkitie et al. (2019) are all building or presenting a theoretical foundation based on existing literature, before acquiring raw data through semi-structural interview with stakeholders as data collection method. They are all using a qualitative method to explore the research problem.

The inductive methodology is used to draw conclusions based on raw data collection on the research problem. This method employs with qualitative approaches to create an understanding of a problem or phenomena by exploring a population in order to generalize the findings to develop a theory or conclude on the problem or phenomena (Bryman, 2012, pp. 23–24).

Inductive methods with qualitative data for explorative research problems is commonly used in business research (Bell et al., 2018, pp. 22–24). Presenting paper will therefore have an overall inductive methodology and follows explorative research design with semi-structured interviews as main data collection method. Since many of the literatures for similar problem have used similar methodologies, this method will therefore be preferable as it is proven by scholars.

Although it is important to clarify that this study was explorative research, which seek to explore a problem thorough interview with industry experts, a literature review was also conducted to understand state of the art of the problem, and to guide questioning and interpretation of the interview data. It is also important to highlight that since this paper also drawing on existing literature to study the research question and guide data collection and analysis, the research is characterized by a mixed method of inductive and deductive methodology. However the overall approach is inductive methodology where collected data will be used to draw conclusions. The figure below show the overall research design for this thesis.

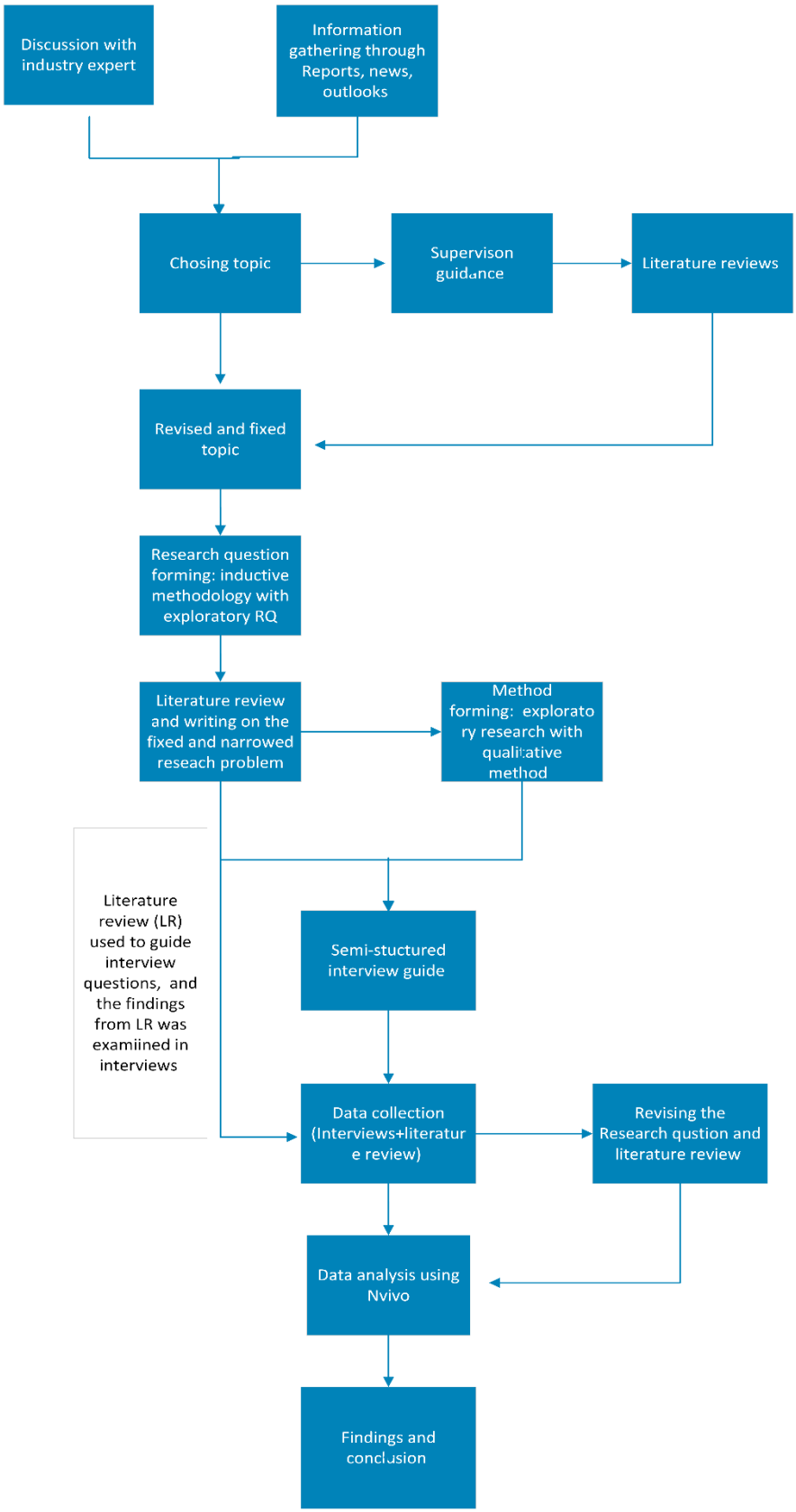

Figure 5: The figure illustrates the overall work process for this thesis. It shows the research design for presenting research.

4.3 Data collection

Data collection can be defined as methods to gather information that can be organized into valuable data to be studied, interpreted and disseminated as knowledge (Frankfort-Nachmias et al., 2015, p. 167). The data collection methods can be categorized into two different groups based on their nature: primary and secondary data (Dudovskiy, n.d.).

This research paper have collected primary data. The primary data is directly collected from the sources where the research problem was investigated (Bell et al., 2018, p. 12). As mentioned earlier in, this research follows a qualitative data collection method and have employed **personal semi-structured interviews** as primary collection method (Frankfort-Nachmias et al., 2015, pp. 170–171).

4.3.1 Themes and concepts for data collection

The interview guide was designed to explore key theme and to identify important concepts and information that can be valuable for the research. The guide is structured in 5 sections consisting of introductory questions, 3 sections on the 3 different main themes and concluding questions, totally 13 questions. However the interview was designed to be semi-structured and therefore was the questions open-ended, in order to allow the participants to talk, explain and express their meanings and thoughts as they wanted. This design allows to collect rich raw data from the experts. The interview guides are presented in Appendix 1. The literature review helped to form interview questions and at the same time the identified potential key themes from literature review was also incorporated into the interview guide in order to assess them. Explored themes through literature and interviews:

<u>The literature review covered following themes:</u>

- **Norwegian OSV segment** and its current trends.
- **Offshore wind industry** and its trends.
- **Drivers** for transition.
- **Barriers** for transition.
- **Success factors** for transition

The interview question covered the key themes:

- **Drivers** for Offshore service vessel companies in transitioning towards the offshore wind market.
- **Barriers** for Norwegian Offshore service vessel companies in transitioning towards the offshore wind market.
- **Success factors** that determine the success of transition for Norwegian Offshore service vessel companies that serves offshore wind market.

4.3.2 Literature review method

The literature review can provide reliable data from credible sources such as recently published studies. Data from literature review is reproducible and therefore easy to be tested and validated by other researchers. Reviewing previous studies gave better understanding the current state of the topic and provided a framework for this studies data collection, analysis and interpretation.

4.3.2.1 Goals for the literature review

The literature review for this paper have several objectives. Firstly, it aims to examine whether previous studies can help answer the research questions of presenting master thesis. Secondly, it provide rigorous academic support for the main topics to be investigated. In doing so, the literature review can explore in-depth and detail to verify the relevance of the presented research problem and contribute to critically examine subjective assumption that are made in the introduction part. Thirdly the review help to form and guide the question for interview questions and thereby helps to create a framework for data collection and the research interpretation. For example, to assess the barriers origin according the multi model perspective.

Fourthly, a comprehensive literature review can also contribute to identify ideas that can be used to solve the research problems, such as keywords to search for, themes to use, other data-collections and processing methods, and integration of data from other research fields. Lastly the literature review can help to identify previous used methods by other researchers to solve similar problems. Identifying solid methods will ultimately lead to more precise data collections and thereby enhance the validity of the research findings.

4.3.2.2 The literature search strategy

The literature presenting in this study is sourced from online databases, including Scopus, Science direct, Semantic Scholar and Oria. The search engine Google Scholar was also used as for articles and reports. Additional reports and publication were obtained from independent organizations such as the Norwegian Shipowner's Association, Norsk industry, DNV, Clarkson Intelligent, and official webpage of the Norwegian government.

The literature search was divided in three phases in order to gain overview and gather knowledge about the relevant topic. The first literature search phase began with keywords such as “transition”, “transition management”, “sustainability transition”, “energy transition” and “business transition”. This phase helped to gather fundamental knowledge and understanding of **transition** in business context.

The second literature search phase was more defined because the first phase gave insight into the transition management topic and ideas for keywords. This process was characterized by combining keywords used in first phase with new keyword related to industries that are similar to OSV and relevant industrial area such as “onshore wind”, “offshore wind”, “renewable industries”, “Norwegian offshore service vessel companies”, “oil and gas industry”, and “offshore wind industry,". The operators AND” and OR helped to merge together the different keywords in the search boxes in different databases.

The last article search phase was done to find literatures that can be used investigate the main themes of the research question. The new keywords added to the search boxes in this phase was “drivers”, “opportunities”, “challenges”, “barriers”, “obstacle”, “success factors” and “success factors”. These keywords combined with the keywords mentioned in the two previous phases led to more accurate search result to identify the main components of the research question.

Other criterion used to aim for accurate search results was published year, type of literature, research domain and language. The publication year was set to 2000-2023 for first search phase, 2010-2023 for second- and third search phase. Type of literature was limited to “Research articles”, “Book” and “Book chapter”. Research domain was set to “Business, Management and Accounting”, “Social science” and “Energy”. Lastly the language was only English.

The chosen articles have been chosen by straining through an organized search process with criteria that helped to increase search accuracy and relevance of literature that will be used to give a theoretical understanding of transition and to investigate the research problem.

4.3.3 Primary data collection

A semi-structural interview have been used to achieve many main objectives. Firstly will a semi-structured interview guide the conversation in the desired direction, which is to identify the main themes for the research questions. Secondly it will allow the participants to contribute with their knowledge and to express their expertise through elaboration. Thirdly a semi-structured interview allows to identify new concepts, ideas and key information to be expressed as the research question it exploratory and are not studying a fixed theory or hypothesis. Follow-up question will help to access more valuable information about a topic when needed. Semi-structured interview gives direction and at the same time agility to explore problems and key information that have not been identified yet (Bell et al., 2018, pp. 436–438).

The first interview was carried out in telephone and voice-recorded in private computer because the participant preferred a phone call. This interview was also carried out in English but remained 4 interviews with 5 participants (2 participants from one company) was carried out in Microsoft Teams in Norwegian with simultaneously recording and transcribing function. The research for changing languages is that all of the participants was Norwegian, and by interacting in their mother tongue encouraged them to voice their thoughts. The transcript was lately translated from the machine translation service DeepL. The AI have provided translation service with high accuracy.

The data was collected from a population of 6 participants, who was employees from 5 different Norwegian firms. As mentioned earlier 5 of them where from OSV firms while 1 was from Norwegian Shipowner Association. The participant from NSA was working with a dedicated department for Offshore wind. These individuals are all currently working in their respective firms and have contributed with relevant information that can be organized and synthesized to study the research questions. The informants' names are disclosed, and they are called as "Participants 1-,2-,3" and so on. This is shown in the figure below.

4.4 Ethical considerations

The research ethics is important to maintain in any research in order to secure a good and responsible research. This research project is following research norms and guidelines I order to maintain good scientific practice, responsible and protective relations to individuals and organizations that are involved in this research and to maintain an overall social responsibility. Data that have been collected, reviewed and used have been referred to the respective authors and owners. As a student researcher I have been careful to give the credit to the right owner as it is highly valued research norm for me.

The research project, data management and handling of anonymity and confidentiality measures for this research is viewed and controlled by the Norwegian Agency for Shared Services in Education and Research. Such an approval from an independent organization like this contributes to secure the quality and responsibilities of this research project.

The informants that have been participated in the research project have been informed about the objective of the study and their role and rights to withdraw at any time without providing reason. The interview was only conducted with consent and the participants was informed about my responsibility to keep the data confidential and the participants anonym. This was provided through a confidentiality and non-disclosure statement which was prepared by the University of South-Eastern Norway. Every interaction including provided information was given written through e-mails to the participants.

Comapany	Participants	Position	Experience in years the company
Company 1	Participant 1	Vice President of Investor Relations and Corporate Communication	>10
Company 2	Participant 2	Chief Technology Officer	
Company 3	Participant 3	ESG Director	
Company 4	Paritcipant 4	Chartering & Operation Officer	
	Participant 5	Maritime Operation manager	
Company 5	Participant 6	Consultant	<10

Figure 6:The figure below gives and overview of the number of participated company, participants their positions and experience in the company.

4.5 Data analysis

The research problem present a need for identifying patterns, themes, and concepts in the vast qualitative and unstructured data. This need has led to grounded-theory analysis method is used to discover new concepts and findings within the raw qualitative data (Bell et al., 2018, pp. 518–521. Grounded-theory data analysis method is suitable for an exploratory research problem like this thesis present. A thematic coding strategy was also implemented in order to identify already fixed themes (codes) based on research problem and literature review (Kiger & Varpio, 2020, pp. 846–847).

Thematic coding was conducted based on the initial ***themes*** that was identified in literature review for the key concepts of the research problem. At the same time ***In Vivo coding*** technique was also used in order to identify new concepts. The In Vivo coding allows to extract themes from the raw data (Kiger & Varpio, 2020; Manning, 2017; *Thematic Analysis - an Overview*, n.d.).

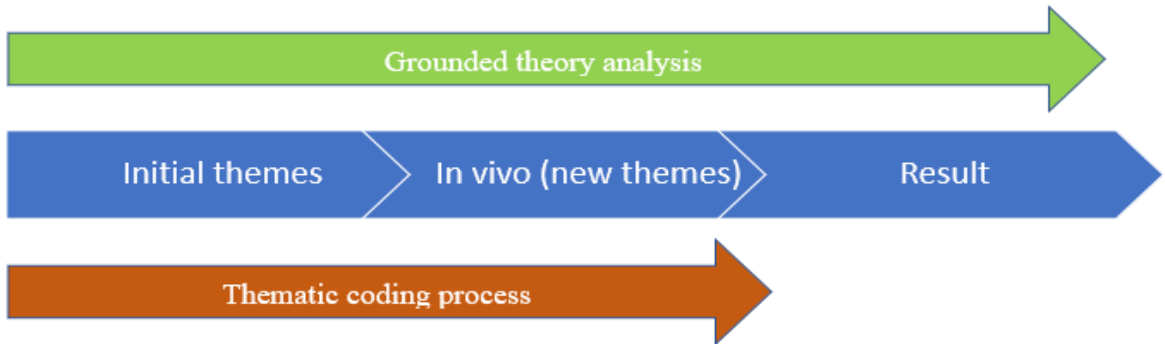

Figure 7: The figure illustrates the methods and techniques that was used in the data analysis process.

Such an analysis process of qualitative is time-consuming and present limitations such as subjective interpretation that in consequently might corrupt the developing concepts to be inaccurate (Kiger & Varpio, 2020, p. 850). Despite that, there are compelling technique and instruments to minimize these constrains. The collected data was analyzed with the help of Nvivo to reduce the time-consuming process of organizing and analyzing data. Also the IN vivo coding technique helped extract themes based on the interview participants words, which reduces subjective interpretation from me. The already identified themes from research question and literature review was organized and provided a framework for what to include and exclude for data extraction process.

4.5.1 Presentation of coding

The thematic coding started with the key themes, drivers-, barriers-, and success factors for transition. These key themes gave a framework and help to strain the data as **first layer themes**. **The second layer** for themes was initially taken from the findings in literature review which is presented in figure 4. Thereafter the in vivo analysis strategy allowed to identify new themes that was added in this layer. **The third layer** of themes consist of sub-themes that was identified through analysis of raw data, which also presents different aspects of second layer themes.. The figure below shows the coded data and its character in picture.

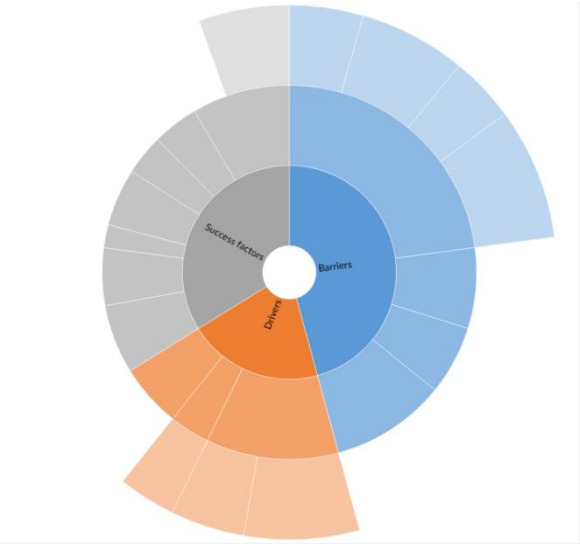

Figure 8: The figure visualize the code structure, orange is drivers, blue is barrier and grey is the success factors

Drivers have 3 themes and 3 sub-theme, while barriers have 4 themes and 4 sub-themes. Success factors have 7 themes and 1 sub-theme. Figure below gives numeric presentation of the data after coding process. The Result chapter will present the data that have been extracted from the thematic coding. The objective of this chapter is to assess the relevance, importance and function of the identified transition factors through literature, and to identify new findings that can help answer the research question.

5. Analysis and Results

This chapter presents the results of analyzing data from interviews with industry experts. The analysis is based on the research question, which focuses on identifying drivers, barriers, and success factors for Norwegian offshore service firms transitioning from oil and gas to the offshore wind industry. To organize and present the findings, a thematic approach is used based on the themes that emerged from the data analysis process. This approach highlights the most important and relevant information and makes it easy to follow the key findings. Firstly, the analysis of the main themes (layer 2) that emerged from the literature review will be presented, followed by the new themes that emerged from the thematic analysis process. The results in presented in following order:

Transition factors	**Main themes**
1. Transition Drivers	1. Political drivers 2. Economical drivers 3. Transferable competence
2. Transition Barriers	4. Technical barriers 5. Economical barriers 6. Oil and gas barriers 7. Political barriers
3. Transition success factors	8. Clear and narrative vision 9. Collaboration 10. Business model 11. Innovation 12. Communication 13. Political support

Table 1: Overview of the themes and the chronological order they will be presented in, in this chapter.

5.1 Transition drivers

This section will present the result of data analysis on drivers for Norwegian OSV firms' transition. The theme that was identified in literature that also was found in the raw data is **political driver**, while **economical drivers** and **competence drivers** emerged from the coding process.

5.1.1 Green investment as political driver

The political drivers was further coded as "***Green investment***" because participants from three-fifths of the firms anticipated political drivers with "green investment". The sub-themes "Green investment" emerged as a pattern in the raw data for question that was asked for providing political drivers. The coded data shows 7 verbal *references* (number of citation from the participants in the coded data) from 3 out of 6 participants.

When participant 2 was asked: "*Are there any other such political factors that influence, that act as a driving force?*" Participant 2 answer this:

"*Hmmm. The regulation in a way on. Green and brown and black sort of areas in terms of sort of funding so that. It is flagged that it should be cheaper to finance projects against green projects that are then defined as offshore wind projects*."

While Participant 3 provided the following response when asked about political drivers:

"*Hmmm that bank one thing with the banks they were more of loans for a green, i.e. new build today. Would clearly be easier to finance towards offshore wind.*"

The last person who connected political factor with green investment is participant 4. During the interview, Participant 4's colleague (Participant 5) exhibited nonverbal cues indicating agreement with the statement. Specifically, their body language suggested agreement, as evidenced by nodding the head. This observation provides additional support for the idea that the OSV firms that participated connect green investment as a political driver toward sustainable transition.

The answer from participant 4 was:

"Today, if you're building a ship today, you have to make some green choices, and we all are. I really think that we are, and all our competitors are. Nobody wants to pollute."

The analysis found that "Green investment" emerged as a sub-theme in the raw data when participants were asked about political drivers for a transition from oil and gas to offshore wind. Three out of six participants mentioned green investment as a political driver, with seven verbal references in the coded data. Green investment is driven by political factors such as regulations and loan policies for green projects, as mentioned by Participants 2 and 3. These findings suggest that OSV firms connect green investment as a political driver for transitioning to a sustainable industry and practices.

5.1.2. Economic drivers

The analysis of the data reveals that **economic drivers** are one of the motivating factors for Norwegian OSV firms to enter the offshore wind industry. These findings indicate economic benefits of offshore wind may be an important consideration for firms seeking to operations in offshore wind. The economic drivers were further identified into 2 sub-themes, namely **growing market opportunity** and **risk spreading**. The figure 10 illustrates the weight of the different sub-themes under Economic drivers based on the number of references

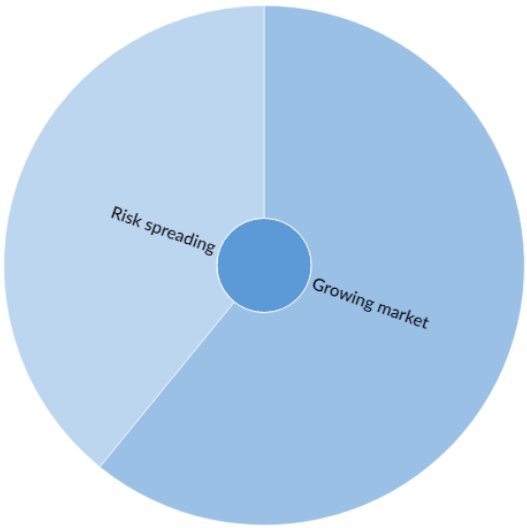

Figure 9: Chart of the Economic driver (the dark blue circle) and its sub-themes (light blue).

The growing market opportunity

According to data analysis the sub-theme, **growing market opportunity**, was mentioned as a driver by 4 of the 6 participants. This sub-themes had 60% of the total references for Economic drivers.

One of the starting questions to the participants was related to their firm's motivation for entering offshore wind. For example when participant 2 gave and detailed answer to explain about their motivation for entering offshore wind industry. The question was formulated this way: "*OK, so I have one question. What are your interests in offshore wind, what is the motivation for you to go into offshore wind?*"

The answer from participant 2 clearly outlines market growth as their main economic driver and additionally pointing out that renewable industries will dominate the energy sectors in the future. Participant 2 expressed it this way:

"*Yes, the motivation for going into offshore wind, you can say that first, is that it's a growing market. It's an industry that is more kind of future-oriented with renewable energy, and that we think is important.*

*So we work a lot in oil and gas, but it's an industry that will be phased out eventually, and then to kind of be in a more renewable part of the industry is a big motivation for us.***"**

While participant 3 was explaining the main reason for the firm to entered the offshore wind industry and further talked about the future motivation to strengthen their position in the industry. The answer that explain their motivation for entering Offshore wind was:

"*It's a cyclical industry, but big downturn in 2014. Hmmm. And at the same time, the wind grew up in Europe, Germany, Denmark and eventually England now, so we actually saw it as an alternative market. So we could get some contracts on wind.*

*And so we are very interested and curious about what floating offshore wind can give of opportunities. Here we suddenly have 2 markets competing with each other. This means that our boats become double attractive.***"**

While answer of participant 5 had different perspective, where the oil crisis was outlined as not the underlying reason for seeking new market opportunities, rather expresses that the motivation came naturally entry with the market growth:

"*It came as a kind of natural idea. It wasn't like when the crisis came in 2014, so. Vessel A, we agreed to put all our efforts into offshore wind came only as a natural.*

What we, we are open to all markets and when the need arose, we had a boat available and ready."

Participant 4 from the same company agreed the colleague:

"So that's what participant 5 said. We kind of move the boats to where it is needed."

Moreover, Participant 6 who represent an association for shipping firms and working to facilitate the offshore wind opportunities is expressing the current and future growth of the offshore wind industry by saying:

"*And up until now, the turnover related to offshore wind has gone up to about 8.7 billion? Yes, there has been such a gradual upward trend for the members of the drift band. And you see the opportunities when you look internationally at different countries that are going to build offshore wind farms, both fixed and floating. And right there, wherever a wind farm is to be built, there is a potential for."*

The analysis of the sub-themes discloses the potential for growth in the offshore wind industry and the importance for the future. The motivation for entering the offshore wind industry was largely driven by market growth. Analysis of the data shows that many participants also highlighted the potential of floating offshore wind farms as a new market opportunity. The turnover related to offshore wind has been increasing gradually, and the international market for offshore wind farms presents a potential for growth in the future.

Risk spreading as a transition driver

Risk spreading as a driver is closely linked to the **growing market opportunities**, which are not clearly distinguished by the participants in their explanations. However the analysis shows to different aspect of the economical driver for a transition towards offshore wind industry. interview analysis reveal that 4 out of 6 participants where in different way expressing risk spreading as a main factor for entering offshore wind industry.

According to participant 1, the management and board made a strategic decision to build their business in both the traditional oil and gas and new renewable industries, including offshore wind. Participant 1 said that "*the strategic decision by senior management and the board of*

the company resulted in this this new business strategy for the company. So, we have a solid leg in the traditional business of seismic and we are now building another leg within the energy transition aspect."

On the other hand, participant 3 answer that was presented in the **growing market opportunity** section shows the link between these two drivers. Market downturn in oil and gas made the firm enter int offshore wind, where it was possible to generate revenue.

The answer from participant 3 was as follows:

"*It's a cyclical industry, but big downturn in 2014. Hmmm. And at the same time, the wind grew up in Europe, so Germany, Denmark and eventually England now, so we actually saw it as an alternative market. So we could get some contracts on wind*."

The response from Participant 3 demonstrates that numerous companies are leveraging offshore wind as a subsidiary or alternative source for spreading risk. The participant also explain the strategies some companies applies to spread for maintaining revenue and cashflow.

Participant 3 explained it this way:

"*Sorry, in addition to running offshore service to the oil, they also have a kind of sub, right? Many shipping companies are organized so that we have a parent company in a way, and then they have a lot of sub-companies underneath that do different things, and not true instead of restructuring the whole thing."*

Similarly, participant 5 statement showed that the company is open to all markets and had a boat available and ready when the need arose, indicating a willingness to spread risk across multiple industries. At the same time participant 4 told that the company decided to acquire ships that can be used for both oil and gas and renewables, further indicating a focus on risk spreading.

The statement from participant 5: "*What we, we are open to all markets and when the need arose, we had a boat available and ready*."

Participant 4: "*No and yes, and we don't have that now either. We have a strategy meeting with us last summer, where it was said that we will try to acquire boats that can be used for both Oil and gas and renewables."*

The data from participant showed that risk spreading played an important role in their firms transitioning to the offshore wind industry. both of the presented Economical drivers was hardly distinguishing by the participants as the observations showed. Overall, the coded data reveals that participant's firms were motivated to enter the offshore wind industry in part due to the potential for risk spreading across multiple industries.

5.1.3 Transferable competence

The theme **Transferable competence** as a driver emerged from the discussions with the participants representing the 4 OSV firms. They have claimed competence that is in the possession of the firm is a reason for entering the OSV industry. However, the participant representing the Association did not talk about competence for transition driver. The analysis outlines the competence is participants' company in traditional offshore business can be **transferable** to offshore wind. Competence was discussed as a factor by 4 of the participants, and they referred transferable **competence** as a driver.

When participant 1 was asked to tell about the firms involvement in offshore wind, the answer was:

"*But again the method you use for getting knowledge about the subsurface is much the same. We need to do some adjustments on the service setup and how we use our equipment and also how we process the data but on the average, it's pretty much the same business*."

Transferable competence is according to participant 1 the current skills, knowledge and other capabilities of Norwegian OSV firms from traditional oil and gas industry can be used to capitalize the offshore wind industry as well.

Participant 2 answer did confirm the information from participant 1. The person was stating that their current competence makes them compatible to operate in offshore wind as well and also highlighting that Norwegian OSV firms are highly competent to operate in Offshore wind industry:

"*Hmmm and then the service that we provide to the offshore wind industry is very compatible with what we do today. We kind of become the people who operate a boat safely and securely, and that's the main job, we're not doing the maintenance on the mill, not on the installations on the logs, but we provide a service that ... will kind of create and deliver a safe and secure platform for our customers."*

"*Yes, absolutely. So we are all. The offshore shipping companies in a way is highly competent and operate in that business here."*

Participant 4 and 5 answer regarding the role competence plays for their involvement in offshore wind showed that most of the competence the firm has is transferable to offshore wind. Also, similarly to participant 2, these two also confirms that Norwegian OSV firms are highly competent to operate in Offshore wind.

Both participants were engaged in the conversation, with participants 4 was stating:

"We have it very much, so with it there is very much that is transferable."

Participant 5 furthered this point by stating:

"Generally speaking, I think we can say that the expertise that offshore shipping companies in Norway have built up over many years in oil and gas is basically slides right into offshore wind. And… yes all of us p well equipped to go in there."

Another participant is providing an interesting information by stating that the floating offshore wind market will be constrained by high technological barriers which probably can only be served by Norwegian offshore shipping companies.

Participant 3 expressed it through this statement:

"And that's my point, that on floating wind, the technology level is so high, the barrier is so high, that it's probably only that will be able to be providers."

The participants representing four Norwegian OSV firms discussed the theme of transferable competence as a driver for entering the offshore wind industry. They claimed that the current skills, knowledge, and capabilities possessed by their firms from the traditional offshore business can be transferred to the offshore wind industry. The analysis showed that competence was a factor discussed by most participants and that Norwegian OSV firms are highly competent to operate in the offshore wind industry. One participant outlined that the high technological barriers in the floating offshore wind market can probably let only Norwegian OSV firms to serve this niche.

5.2 Transition barriers

Transition barriers from literatures such as short-term profitability and high investment cost have been coded as a sub-themes for economic barriers in thematic coding process. While lack of knowledge and skills was not mentioned as a barrier by the participants, rather they focused on technical barriers. The figure below illustrates the different themes and the corresponding sub-themes.

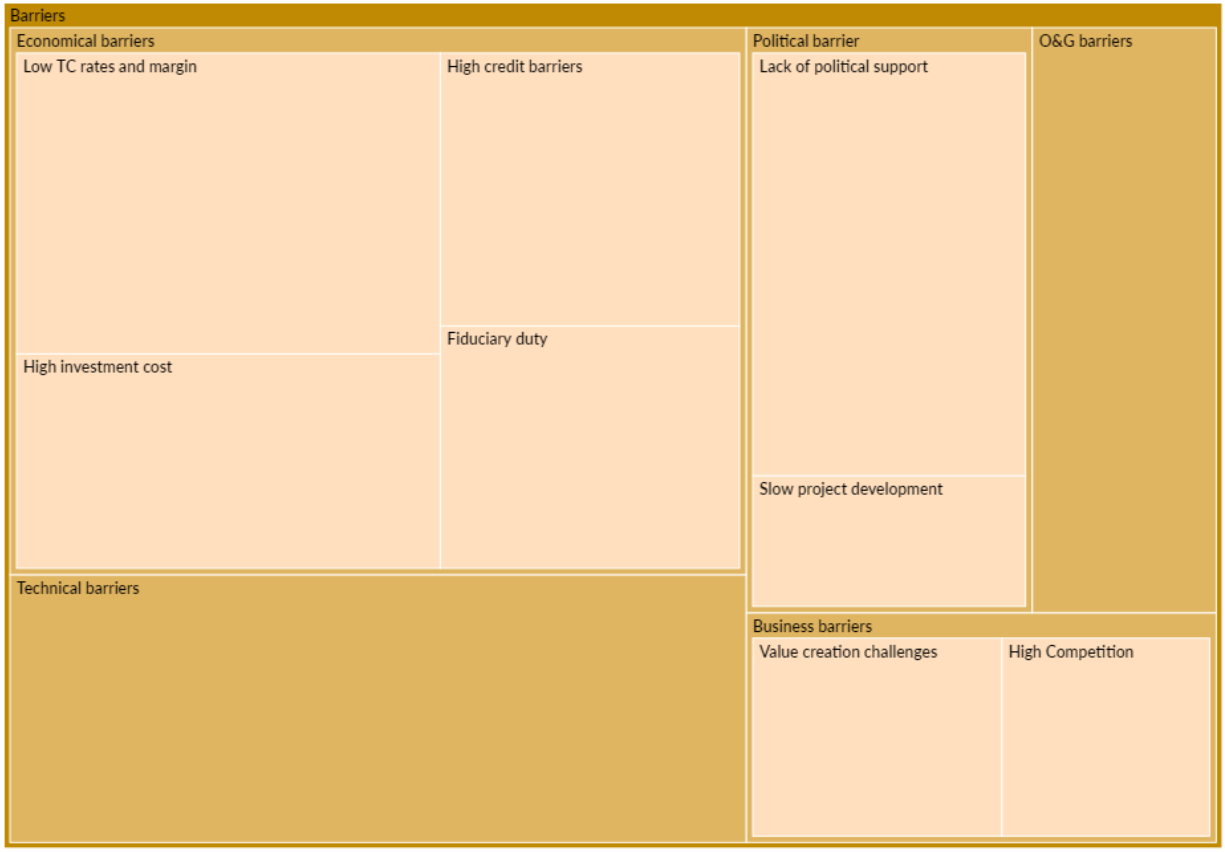

Figure 10: The chart is showing 5 themes (brown) with their corresponding sub-themes (light brown) which is identified as transition barriers for Norwegian OSV firms transition to offshore wind.

5.2.1 The O&G barriers

The data analysis shows that the firms face barriers in transitioning to offshore wind due to the oil and gas industry's activities. This theme was disclosed when the participants were asked what role Oil and gas industry played for their transition to offshore wind.

Participant 2 indicates that the earning potential in the oil and gas industry could shift the balance away from offshore wind. And that some vessels are moving away from offshore wind and into oil and gas. The participant expressed it in following viewpoint:

"I think maybe because of the oil and gas prices going up, maybe it will kind of shift the balance from offshore wind a little bit more to oil and gas, so because of where it is it's driven by kind of the earning potential."

Participant 3 further support this claim by stating that the oil and gas industry has been paying better than Offshore wind and have been the focus of the last couple of years for OSVs. The participant mentioned that the Russian-Ukraine war has increased oil and gas activities in the short term, with higher TC rates for the vessels. The statement of Participant 3 sounds like this: *"And after the Ukraine war, all the energy crisis is like that. So we have seen that oil and gas pay best."*

"Yeah, it had almost been a little bit reverse last in the short term, so had almost reverse. Very much focus on gas extraction, gas projects and drilling. Projects in the spot. It's typically the spot markets commentators moving around these drilling rigs in the North Sea."

"Then turn the focus or was it the other way around that in the last couple of years it has been oil and gas that has been the most important and best paid."

Finally, participant 6 states that the oil industry vacuums a lot of expertise from around the country, which could limit the availability of engineering expertise for OWP firms. Overall, these references suggest that the ongoing activities in the oil and gas industry present significant barriers for Norwegian OSV firms in transitioning to OWP, as the traditional industry is better paid. Participant 6 expresses it in such a manner:

"So the oil industry vacuums a lot of expertise from around the country, which is not available to other companies. And not only do we have one, it applies to most of the people who need a formula for engineering expertise and so on."

In summary, the analysis indicates that the oil and gas industry's activities pose a significant barrier for Norwegian OSV firms transitioning to offshore wind power. The participants noted that the earning potential in the traditional industry is higher, leading some vessels to move away from offshore wind and into oil and gas. Additionally, the focus on oil and gas extraction, drilling, and projects in the spot market has been higher in recent years, limiting the transition to the offshore wind industry. the next section will be an analysis of the economic barriers as a themes.

5.2.2 Economic barriers

A pattern of different economical barriers was observed in the raw data from the interviews, which later was coded in 4 sub-themes. The sub-themes are **fiduciary duty (short-term profit), high credit barriers, high investment cost** and **low TC rates and margins.** Fiduciary duty was defined as short-term profit in literature as the table below shows, the data for fiduciary duty was extracted from the interviews with Participant 2, 3 and 4&5. According to the table, Participant 2-, 3- and 4&5 was active and contributed with most data on economic barriers.

The sub-themes	Participant 1	Participant 2	Participant 3	Participants 4&5	Participant 6
1: Fiduciary duty	0%	27,43%	21,53%	51,04%	0%
2: High credit barriers	0%	7,51%	56,76%	23,72%	12,01%
3: High investment cost	18,28%	18,66%	63,06%	0%	0%
4: Low TC rates and margin	0%	33,33%	41,83%	4,67%	20,17%

Table 2: The table shows the contribution of each participants on the different economic barriers

Fiduciary duty as barrier

Fiduciary duty is the action taken to secure the interest for the shareholders of a firm. Many of the participants have discussed that their company will act according. Participant 2 indicates that the long-term perspective required for a successful transition to offshore wind may conflict with shareholders' need to generate income. This interview highlighted that firms might prioritize short-term profits over long-term investments in transitioning to the offshore wind industry. Participant 2 explained this during the question about how important it is to have a business model that is appropriate for offshore wind industry:

"Yes, we have our first, so we have to generate some kind of income for our shareholders, so to always have a sustainable business model is very important.

In that model, it must think about the long-term in relation to what you get in return. So a long contract can in a way be part of the decision... Hmmm. The decision-making basis can be called that in relation to thinking about a transition from oil and gas"

Similarly, Participant 3 explains that their firms prioritize maximizing profits and going where the highest rate of return is, regardless of whether in the oil and gas industry or offshore wind. This also reveals that the fiduciary duty to maximize profits may prevent firms from investing in offshore wind if it is less profitable than the traditional oil and gas industry.

"But we are like everyone else, we want the highest possible return, so we go where the highest rate is."

"As I said, we go for the job with the highest return on investment."

"We have a strategy to maximize our profit, and if oil and gas makes the most profit, then that's where we go."

Finally, Participant 4 pointed out that the board's focus on maximizing profits may cause companies to prioritize industries with higher profit potential, such as oil and gas. The participants also stated that companies have a duty to shareholders to operate as profitably as possible, which may prevent investment in the offshore wind if it is not as profitable.

"Then the board's demand to those who will manage this here. That you manage to navigate where there is the most money to be made."

"There is no resistance like that, but it's just that you say that you.If you enter into a contract, a 5-year contract in offshore wind that pays 1/4 of what you could get in oil and gas or vice versa, then there will be a penalty on the stock exchange."

"We have a duty to our shareholders to operate as profitably as possible."

The analysis helped discover that fiduciary duty, which is the responsibility to secure the interests of a firm's shareholders, plays a crucial role in firms' decision-making process regarding investments in the offshore wind industry. The participants noted that the fiduciary duty to maximize profits might cause firms to prioritize short-term profits over long-term investments in transitioning to the offshore wind industry. The interview also highlighted that

companies have a duty to operate as profitably as possible, which may prevent investment in offshore wind if it is less profitable than traditional industries like oil and gas.

Low TC rates- and margins

The interview with the participants helped discover a contrary finding to literature review, which indicated TC rates as an opportunity. According to data analysis 5 of the participants aid current TC rates and margin in Offshore wind is comparatively to oil and gas very lower. And therefore making this theme a barrier for many of participants' firms to increase their involvement in this industry.

Participant 2 highlights that traditionally low margins in the offshore wind market and explains that they face challenges finding good business models and funding due to the low TC rates.

This is expressed in this way:

"What I think is that offshore wind has traditionally been a subsidized market, so that means that the margins in that market have been very low. It's still relatively low margins. It's mainly that it's low rate, so it's difficult to find funding and find business models that are good enough to make an investment."

Participant 3 discusses the low TC rates in the bottom-fixed offshore wind market and refers to the high costs focus because governments subsidize the projects in German and Denmark. According to this informant a long-term contract in OWP can secure some earning for the vessel, but the rates are considerably low. Further explains that their firm have decided to not make major investments in vessels for bottom-fixed OWP segment.

Participant 3 statement about low TC rates and low margins:

"Yes, and the rates were very low. Bottom fixed wind is in Denmark and Germany very subsidized,. so huge focus on the costs."

"*Hmmm then you typically get one of those ten-year long contracts at very low so the only thing you know when you win one of those.*

Where the whole industry we were cities is that you earn the least.

So it's a paradox, but you secure work for that ship for a long time for a new build. Hmmm. So we have actually made a decision to not focus on newbuilds and major conversions on bottom fixed. We will take these projects if it suits us."

Participants 4 and 6 confirmed the statements the two participants presented, by saying:

"*Until now, you could say that it is TC rates in offshore wind have been low."*- Participant 4

"When you have a good supply of projects, we also do it in a way that you can scale up. But that's again one of the big challenges in the offshore wind market is the need to scale up in order to be able to create in a way to get a little bit more mass production and thus have better earnings on it because it is."

"The second biggest problem is costs and slash lack of earnings that it is the margins are too low simply the biggest or the biggest challenge"- Participant 6

The interviews with the participants highlighted the challenges firms face in the offshore wind industry due to low TC rates and traditionally low margins. This finding contradicts the literature review, which identified TC rates as an opportunity. Participant 2 emphasized the difficulties in finding good business models and funding, while Participant 3 discussed the focus on cost and low TC rates in the bottom-fixed offshore wind market. Participants 4 and 6 confirmed the low TC rates in the industry and identified scaling up as a challenge for firms to increase their involvement.

High investment cost barrier

The Norwegian offshore service vessel (OSV) industry faces a high investment barrier, hindering firms from transitioning to new projects. The analysis of three participants' comments reveals the challenges of investing in equipment and vessels. At the same time the data analysis disclose a significant obstacle for OSV firms investment in new assets: high credit barrier from banks. This will be analyzed in next section sub-theme.

Participant 1 emphasizes the uncertainty and risk of investing in equipment and vessels for geotechnical operations, which would require a significant financial investment. According to this informant the major uncertainty is the return on the investment. This information was disclosed when the participant said:

"If we decided to do that, we had to invest in equipment. We most likely also had to invest in vessels. For geotechnical operation, which would entail a significant investment for us, which we also would have been uncertain about how much return we would get from that investment."

Similarly, Participant 2 highlights the additional costs associated with meeting Flag State requirements, which increases the overall investment barrier:

"Flag State requirements for the vessel base you haven't addressed that, but and that again goes back to the investment cost if you if you have to build a boat that covers all possible Flag State requirements, then you get a higher cost and thus a bigger ... Hmmm investment barriers."

Participant 3 outlines the challenges of transitioning to floating wind projects, which would require investment in new ships, and long-term contracts to be commercially viable for them. Further, the person highlights challenges associated with investing in new custom-built vessels after the end of OWP project, which will lead to limited resale value of these vessel. Additionally, Participant 3 does also discussed the role of banks in financing new construction projects, highlighting the banks' risk aversion, which makes it challenging for shipowners to invest in new assets.

This is how the participant expressed it:

"On floating wind. It will as seen started for 26 twenty-seven 28 there will be very many needs, so then it will take 3 years both from or 2 and a half years, so we really have to say commercial contract maybe next year."

"But as I said we have made a little distinction where we have stopped a little bit. We do not want to make more investments in anchored vessels. There it will be more like project on project with existing tonnage."

"And if a boat is too custom built for that contract, then after 10 years it is unsellable for the next project. But there are very few who will realize it because they can't finance the new building."

"But no new construction, and that's mainly because of the banks are holding back. So the banks have become risk averse. So it's only when they get a long contract example times, then you can go to the bank and ask if you can borrow money."

In summary, the Norwegian offshore service vessel industry faces a high investment barrier that hinders firms' involvement in new offshore wind projects. The analysis reveals significant obstacles to investing in equipment and vessels, meeting Flag State requirements, and transitioning to floating wind projects. Moreover, banks' risk aversion and the importance of securing long-term contracts as a prerequisite for obtaining loans also hinder investment in new assets. The following section will further analyze the risk aversion of the banks.

High credit barrier

The Norwegian OSV industry is encountering difficulties in moving towards the offshore wind sector because of the reluctance of banks to provide loans, leading to considerable credit barriers. A thorough data analysis has exposed an evident pattern of banks becoming more risk-averse, which has emerged as a notable new theme.

Firstly, the participant 2 stated that "*it's difficult to find funding and find business models that are good enough to make an investment*". Which indicated that finding fundings for making investment in the new business area was challenging for their company.

As Table 2 shows, Participant 3 had most input on this sub-theme and further explained that the banks have become risk-averse after many of banks who invested in OSV industries have lost money. Participant 3 argues that the lack of new construction is mainly due to the banks holding back. This could mean that the banks are less willing to take on loans for new projects, including OSV firms seeking funding for expansion or new vessels.

The informant outlines it in this way:

"But no new construction, and that's mainly because of the banks are holding back. So the banks have become risk averse."

"The disadvantages again are that the banks will say show us the contract on time at least, and not everyone is able to do that today. It's a bit like that, but it starts with the banks."

"But there are very few who will realize it because they can't finance the new building."

The same barrier have been identified by Participant 4 as well. In the interview, according to the informant it is challenging to fund a vessel for oil and gas project. This was outlined in such way:

"Then it is still difficult getting funding for oil and gas."

"Yes, so that. It depends a little bit on the banks and at the same time that there was no infrastructure or solution on fuel and stuff and today."

At the same time, Participant 3 and 4 explain that banks may be more willing to provide loans for green energy projects. This suggests that OSV firms operating in offshore wind sector may have better access to funding than those in the traditional oil and gas industry. Although the contract have to be of significant value in order to get loan form the banks.

Participant 3 and 4 explains it in this way:

"Yes, and you have to. Today, if you're building a ship today, you have to make some green choices (...)."

"Hmmm that bank one thing with the banks they were more of loans for a green, i.e. new build today. Would clearly be easier to finance towards offshore wind."

. "So it's only when they get a long contract example times, then you can go to the bank and ask if you can borrow money."

In summary, the Norwegian OSV industry faces credit barriers as banks become more risk-averse and reluctant to provide loans for offshore shipping firms' new projects. The informants highlighted the challenges of obtaining funding for new construction and expansion, with banks requiring contracts and showing a preference for green energy projects. The findings suggest that the OSV firms operating in the offshore wind sector may have better access to funding than those in the traditional oil and gas industry.

5.2.3 The technical barrier

The theme of technical barriers was raised by a most participants, with a degree of consensus on certain issues but some divergent perspectives on others. One particular barrier identified by many participants that operate in both the oil and gas and offshore wind energy sectors is the lack of adequate solutions for vessels, and offshore wind turbines and farms.

Specifically, participants highlighted the difficulty of finding adequate solutions with such as walk-to-work bridges, which enable the safe and efficient transport of personnel and equipment to and from wind farms. Participant 3 noted that hiring a walkway from a third party presented an expense, and at the same time it have to be assembled and reassembled for each wind project the vessel in involved in. This was reflected in the following statement from participant 3:

"*We need to hire a walkway from a third party for the projects. So there might be the biggest barrier we have then, so when we offer tonnage and ship, it's day rates for ship plus rate for walkway.*

*Those who win a ten-year contract on a sleep or one. They have a permanent hallway with installed finance will work on it in time. But a boat that is going to serve oil and gas and wind has to go on and off with this equipment.****"***

Another problems that is disclosed is that the current vessel dimensions of many Norwegian SOV might not be suitable for floating offshore wind projects. As participant 3 put it:

"And we also see that they are for example an SOV of 85 meters, which is typical for a bottom fixed. For example Doggerbank or you can go on any SOV, the one to company X or to yeah Company Y and they are typically between 80 and 90 meters, and they don't have the opportunity. Don't have a chance to work on a floating field."

Participant 4 statement supports and further explain the technical challenges with offshore wind turbines:

"You, you're going up to these turbines, and they're getting bigger and bigger, and it's getting higher and higher, so you have to have bigger and bigger vessels, and you have to reach higher and higher to help you. One thing is that the ships that were relevant 5 years ago may not be relevant anymore if they simply can't reach up."

Participant 6 on the other hand is having a different perspective and discuss the lack of technical competence within engineering field. According to the participant the firms lacks competence with digital transformation and ICT. The person put it in this way:

"*Yes, but not true, that we have not. We have not used any figures specifically on the offshore wind industry, but we have it on the shipping companies, in our economic report, and it is particularly ICT competence digitalization that*."

Overall, the participants in the study highlighted technical barriers as a major challenge for them. One significant challenge faced by firms operating in both oil and gas and offshore wind energy sectors is the lack of adequate solutions for vessels, offshore wind turbines and farms. Walk-to-work bridges were mentioned as a specific problem due to the expense and need for assembly and disassembly for each project. The size of vessels was also identified as a problem for floating offshore wind projects. Additionally, participants noted the need for bigger and higher-reaching vessels to reach increasingly large offshore wind turbines. Some participants also mentioned a lack of technical competence, specifically in digital transformation and ICT, within the engineering field.

5.2.4 Lack of political support

The last themes that emerged from data analysis is **lack of political support**. According to the analysis 5 participants have mentioned political factors as barrier for their transition towards offshore wind. Lack of political support is presents different aspects of the political insufficiency that hamper the involvement of the Norwegian OSV firms in offshore wind. Participant 2 and 3 talked about the constrains regulatory, especially tax related they faces when their fleet have to operate within other states territorial seawater (12 nautical mile zone).

The participant 2 explained it in this said:

"No, no, it's more it's not specific to offshore wind. It's more flag state requirements in terms of the different flags operating slightly differently. Hmmm so it's more general for shipping, there's still the same barrier for and then there's the fact that offshore wind operates both inside and outside 12-mile zones."

Participant 3 said:

"*There are probably some exceptions and deviations you can apply for, but that's not something we focus on and the 12 mile limit, right, yes, for us it's more people to tax the employees then.*

If we go into 12 miles and in particular England, there is a lot of tax liability that occurs for seafarers."

Participant 4 and 5 on the other hand was focus the lack of regulatory framework, precisely for fuel requirements and funding systems for OSV firms. The data reveal that the systems for governmental funding of innovation projects by OSV firms lacks standardized and stable frameworks the actors can relay on. The political uncertainty and lack of support for development is a major barrier according to the informants. They do also refer to other the Dutch Governments who provides more support for Dutch OSV firms in offshore wind projects, and outlines that this is missing Norwegian political regulations:

"There are many. There are a number of options on the table today, but another problem. That is that there is no regulatory framework for those options. First of all, there is no perfect solution for those options."

"*Exactly how they get support there are different ways they get support like that.*

Like our own project we were involved in, we used one of these, for example biodiesel, so that it should be almost carbon neutral, about to say. And it's a diesel that costs about twice the of regular marine diesel. But there was the Dutch government involved, and certainly demanded to support it."

The lack of political support for the Norwegian OSV industry is a major obstacle in the sector's transition towards offshore wind. Regulatory constraints, tax liabilities, and the absence of standardized and stable frameworks for governmental funding of innovation projects are identified as the primary political barriers. The informants also noted that the Dutch government provides more support for Dutch OSV firms in offshore wind projects.

5.3 Success factor for transition

Success factors for transition to offshore wind industry was examined through the interview. The data analysis led to 8 success factors, where pattern of 2 new themes was identified. The data analysis of success factor helps to assess their validity and relevance for Norwegian OSV firms transition from oil and gas industry to offshore wind industry.

5.3.1 clear and narrative vision

First themes in transition success factors is clear ad narrative vision, which was identified in literature a critical factor for facilitating transition. the collected from the participant reveals the role of appropriate vision for transition. the data was extracted from 4 participants and 1 on them are directly using the word vision and explains that it play an important role for their firm, while 2 others are discussing it by refer to long-term strategy. One of the companies denied that they have a specific sustainable vision.

Participant 2 explained how they are using vision to communicate with external words to show that their company will stay in offshore win business for the long-term run. Having a sustainable oriented vision is important for the company to build customer base and communicate that they will be a stable partner in the offshore wind industry. When asked what role vision plays for their offshore wind business, the person answer:

"*Yes, I think it is. I think that's important to have.*
*It's quite important because you have to show that you're going to be there for the long term and not a short-term player, so you have to show that if you go in there, it's to be there for the long term. So that customers have a solid partner to relate to.****"***

Participant 1 and 4 on the other hand is referring to their strategies regarding the company's vision and transition to offshore. According to participant 1 their company is in the process of exploring the sustainable business areas and tells that their company have made strategic decision for taking part in the transition and looking for new sustainable offshore industry.

Participant 1 explains it here:

"Yeah. Well, it's the energy transition which kind of started to evolve back in… Yeah, 2018 to 2020. And of course the, over the last couple of years have accelerated, so we had a process internally to look into other areas where we could use our expertise and our assets to build a

business within the energy transition space and. Came up with our new energy business in 202x. Basically our strategic decision by senior management and the board of the company which resulted in this this new business strategy for the company."

When Participants 4 and 5 were asked if they have transition or sustainable oriented vision, the answer was ambivalent where they are explaining that they don't have a such a vision, however at the same time they explains they have made strategic decision of acquiring ships that can be used for oil and gas industry and renewable businesses. Participant 3 answer is on contrary to everyone else, where their company do not have such a vision.

Participant 4 said:

"No and yes, and we don't have that now either. We have a strategy meeting last summer, where it was said that we will try to acquire boats that can be used for both, oil and gas and renewables."

The data analysis indicated that having a **clear vision** plays a crucial role in building a stable customer base and communicating a long-term commitment to the industry. While two participants refer to their company's long-term strategy, two others have an ambivalent response regarding having a sustainable vision but explain the strategic decisions their companies have made to acquire ships for both oil and gas and renewable industries. One participant reported that their company does not have a sustainable vision.

5.3.2 Capabilities as success factor

Furthermore the importance of skills, knowledge and competence was presented as capabilities to the participants for assessing Norwegian OSV firms capabilities to capitalizing offshore wind. The analysis indicated that all of the participants agreed that Norwegian OSV firms are highly competent and will play an important role in the future offshore wind market because of their capabilities.

Participant 1 was explained that their firm is capitalizing all of their internal resources in order to success in the renewable business, including offshore wind. According to the informant the firm have established R&D department, a new renewable business unit and recruiting external experts from businesses such as offshore wind into the firms' leading positions in order to succeed with the transition.

Participant 1 explained it this way:

"So of course we have capitalized as much as we can on our internal expertise. And used some external expertise when we have seen the need for it."

"We have a R&D department in Company 1. They are also engaged in developing our ***New energy business****.*

"Well, offshore wind has really been a core business in Norway historically, but I think yeah, the skills and capabilities we have from the traditional oil and gas business is skills and capabilities that we can also capitalize on within the offshore wind aspect and we see that already involved in terms of what our peers are doing (...)"

Participant 2 highlighted that their firm and other Norwegian OSV firms have contributed with increasing safety culture to offshore wind. While Participant 3 and 4 outlined that Norwegian OSV firms especially have the capabilities to capitalize offshore wind because after all as they are qualified to operate in the North Sea with rough conditions.

They expressed this way:

"*Yes, absolutely. So we are all. The offshore shipping companies in a way highly competent and operate in that business here.*

*We have a relatively young in a way industry and, and we have probably contributed to, especially the Norwegian shipping companies and increase the safety culture on that or the safety focus****"- Participant 2***

"*We are the Norwegian offshore shipping companies are the most competent in the world on complex offshore people and so on.*

*Yes, you can be approved to operate oil gas, so the spot market, oil, gas or subsea market in the North Sea is the most demanding, in terms of compliance, regulations, technology DP.****"- Participant 3***

*"I think we are going to have an important role in the global offshore wind industry because of the expertise and what we are doing."****- Participant 4***

The data analysis presented the importance of capabilities for assessing Norwegian OSV firms' capabilities to capitalize on offshore wind. All participants agreed that Norwegian OSV firms

are highly competent and will play a crucial role in the future offshore wind market due to their capabilities.

5.3.3 Collaboration

Collaboration was one of initial themes that was discussed with the informants to validate its importance for this specific niche. According to the data analysis, most participants connected collaboration mostly with customer relationship and limited it to it.

Participant 1, 2 and 4 discussed costumer relationship when they were asked the role and importance of collaboration. Participant 1 in mentioned that their company have continued to build the relationships from oil and gas into offshore wind and other renewable energy industries. While second participant focused on how they engaged with costumer and uses constructive communications to build client network. Similarly, participant 4 is also explain that they cooperate with the costumer to find solutions for long-term challenges they faces together.

They puts it in this way:

"So yes, we also intend to capitalize on the relationship we have with the larger national energy companies from our traditional business into the new energy business and that is something that we have done in carbon storage. And also very often in offshore wind, we do see that our core clients from the oil and gas are also the clients that we see in the offshore wind business." ***- Participant 1***

"*(...) but at least we have made it work very well in terms of having an open and constructive dialog with the customers as someone who is new in this field, yes.*

*This said we kind of started with one customer or we showed that we could deliver and from that you can build a bigger kind of a broader customer base.****"- Participant 2***

"Sitting down around the table with the customer, and then thinking out loud and trying to plan, when it's such a long-time horizon." **- Participant 4**

Another participant provide more information on collaborating and explained that they are collaborating with other bigger niche players in order to get more access to offshore wind projects. The participant said:

"And then we have a collaboration with Subsea 7 and Kongsberg maritime on floating winds."

"Very often we are called via a call it a PCI contractor, typically Subsea 7 or Technip or. Yeah, these big boys Deep Ocean."

The analysis revealed that most participants connected collaboration mostly with customer relationship and limited it to it. Participants 1, 2, and 4 discussed the importance of collaboration in building customer relationships and engaging with clients to find solutions for long-term challenges. One participant mentioned that collaborating with bigger niche players is a strategy to gain more access to offshore wind projects.

5.3.4 Innovation as a success factor

Innovation was also another success factor that was discovered in literature and was assessed in the interviews. Innovation was considered as an important criteria by the informants for their transition towards offshore wind industry. Informants form 4 of 5 participating companies mentioned innovation as an important success factor.

As presented above company 1 implemented different strategies to build their business in renewable, including offshore wind. They had R&D department and an own unit dedicated to business transition. Also, Participant 2 expressed that innovation is one of their core value and explains that their company have been a frontrunner in adopting and providing environmentally friendly solutions and innovative operational services for the clients.

Participant 2 elaborated on this by saying:

"Innovation is one of our absolute core values, so we have always kind of fronted environmentally friendly and operationally sound solutions to our customers. So the first thing we do is not the first thing then, but very often we front initiatives that can help them have a better operation, so it's incredibly important, and I think that's one of our most important factors for the transition."

Also Participant 3 and 4 confirmed the important of innovation for succeeding in offshore wind. And further explains that especially floating offshore windfarms and the growing size of offshore wind turbines will require more advanced vessels. These growing requirement in offshore wind need increased focus on innovation. Participant 3 highlighted also that innovation of environmentally fuel solutions will be important for offshore wind industry.

Participant 3 explains it in this way:

"For example the Haywind barge. Equinor hires one of these boats, so when they reach our big Subsea boats that are 120 meters long. Hmmm. From it has a higher Station keeping, has a larger weather window and can work 365 or at least much larger degree than a smaller ship. So floating winds will thus require larger ships, more advanced ships with this system reference systems, deck area cranes, 3D-cranes and so on."

"So providing ships with ships that have reduced or optimized guilt consumption or emissions are probably going to be more important in offshore wind in the future."

Participant 4 statement confirmed this information:

"Specialized vessels within offshore wind as where Innovation will be important to be there it is very often like that when you are going for many shipping companies, so think it is absolutely will be absolutely necessary to go into."

Most participants considered innovation to be a critical factor. Participant 1 shared that their company has an R&D department and a dedicated unit for business transition, while Participant 2 stated that innovation is one of their core values. Participants 3 and 4 highlighted the importance of innovation in developing more advanced vessels and environmentally-friendly fuel solutions for the growing offshore wind industry, especially for floating offshore windfarms and larger offshore wind turbines. Overall, the participants expressed the increasing need to focus on innovation to succeed in the offshore wind industry.

5.3.5 Business model as a success factor

Business model was another themes that was discussed with the informants and a factor that was mentioned by 3 of the participant. the three participants was concern about the uncertainty regarding building a business model that can add value for customer, creates profit for the company and a model that will allow optimal fleet utilization. Two of the participants was also expressed that understanding the customer in offshore wind is challenging as they operates differently from customers in oil and gas.

For example, participant 1 outlined that their biggest challenge is to prove the costumer that their product can bring value for the customers in the offshore wind. At the same time understanding the new value chain is also something they consider as challenging in the emerging industrial regime. In one of the instance, Participant 1 explained it in this way:

"The challenge is, of course, we need to find our way or where we can add value and so far that has probably been the biggest challenge for the new energy group in the company, to kind of map out the markets, how the markets work both within carbon storage and also within offshore wind. Kind of the value chain within those 2 businesses."

"We have received a number of interesting and or number of companies contacting us to get a better understanding of the service that we can provide compared to the traditional geotechnical."

Understanding of the customer is a big key factor to succeed in the growing offshore wind industry. This factor was also identified by participant 2, who elaborated it as mentioned previously. Further the in the interview it was also revealed that another reason for finding appropriate business model is the low earing rates in offshore wind. Participant 2 said:

"It's understanding the customers in a way the customers a little bit different approach in oil and gas compared to offshore wind, so there you have to kind of understand what the customers need."

"It's mainly that it's low rate, so it's difficult to find funding and find business models that are good enough to make an investment."

Participants from Company 4 gave another perspective to business models and connected it with their capital-intensive assets. When Participant 4 and 5 was asked an open question about business model, Participant 5 answered that finding a model that can utilize the vessels in oil and gas and offshore wind industry is vital.

Participant 5 gave a short answer before elaborating on it:

"It's having vessels that is attractive in both industries. Both in oil and gas, and sea wind, who can perform the desired job in both areas."

The analysis showed the importance of finding a good business model for the represented OSV firms in their transition to the offshore wind industry. Three participants highlighted the challenges of creating a business model that adds value for customers, generates profits for the company, and enables optimal fleet utilization. Two participants also noted that understanding the offshore wind industry's unique customer requirements is challenging. Participants from

Company 4 also outlined the importance of finding a business model that can utilize the vessels in both the oil and gas and offshore wind industries.

5.3.6. Communication

Communication emerged as a new themes in the data analysis since 2 of the participants was giving much attention to it. The analysis of coded data reveals that communication plays a major role in succeeding in offshore wind and the transition phase. Participant 1 and 2 elaborated the role of communication in their transition to offshore wind.

Participant 1 highlighted the significance of internal communication to ensure that all staff members are aware of the transition. The person also explained in depth that the firms new energy business was communicated via its website, corporate, and financial presentations. Moreover, the utilization of various channels to promote their initiatives in renewable energy made them more attractive employers and improved external awareness of their involvement in offshore wind.

The coded data showed that Participant 1 explained the importance of communication in this way:

"Well, of course it's communications with internal staff is important in terms of making people aware of that. And we communicate this on our web page, we communicate our new energy business in corporate presentations and financial presentations."

"Yeah, channels, we can communicate our initiatives within the new energy business and also we see that we are probably become somewhat more attractive employer over the last couple of years as a result of that we have."

"(…) in terms of both external people being more aware of that our services can be used for more than just oil and gas, but also new energy businesses such as carbon storage and offshore wind."

During the discussion, Participant 2 emphasized the importance of maintaining an open communication culture within their company, especially when dealing with new customers. Moreover, the company has successfully established constructive and transparent dialogues with clients in the offshore wind industry. It was outlined in this way:

"We have a strategy to have an open communication culture. And, and that's important in

terms of new customers."

"(…) but at least we have made it work very well in terms of having an open and constructive dialog with the customers as someone who is new in this field, yes."

The analysis of coded data from two participants in the offshore wind industry reveals that communication is a crucial factor in the transition phase to renewable energy. Internal communication is essential to ensure all staff members are aware of the transition. External communication promotes their initiatives in the new business areas and increases awareness of their involvement in offshore wind. Maintaining an open communication culture was also outlined as an important factor, especially when dealing with new customers. Establishing constructive and transparent dialogues with clients in the offshore wind industry was a critical factor for success.

5.3.7 Political support

The analysis uncovered a new theme related to political support, which was discussed by the participants. The participant, especially one of them expressed the need for more political interaction with the shipping industry. According to the participants, the support form Norwegian government and politicians will be crucial in capitalizing the offshore wind industry, where the competition is high with other OSV firms with support from their government such as Germany and Dutch players.

The participating companies argued that Norwegian government should facilitate policies and regulations that gives advantage rather than disadvantage when competing with international actors. According to the informants the politician and governmental players can contribute by "*following the market and to have a good dialog with the business community and to be responsive to it. So the input comes from the business community (…)".* Further they are expressing that there should be political stability in regulations, legislations and policies related to the offshore businesses.

Project scale as success factor

Further, another sub-themes was discovered and was connected to political support, namely **project scale.** Project scale is highly linked with political factors, since the according to the participant, politicians must increase the speed of facilitating a home market for offshore wind and scale up the project supplies in order for Norwegian firms to succeed with a transition and to taking a leading position in renewable energy sector. All of the participants have identified project scale as a critical factor in the transition.

The interview data of participants from Company 1 and 2 reveals that both of them argued the need for scale up and facilitate renewable and offshore wind projects in order to increase the potential of these emerging industries. Participant 1 outlined that political framework for the renewable businesses must be established in order to create markets. Participant 2 did also argue that the activities of offshore wind projects need to be expanded and in order to increase the potential of it.

Participant 1 articulated it in this way:

"It will be much easier to scale. Yes, you have some projects around there, early movers, but again it's not scalable yet until you have kind of that political framework which eventually will make market for CSS"

"So it's important with scale so that we are able to build order the continuity for the vessel we have equipped with the key cable. So basically volume is the most critical part."

While participant 2 said:

"It must be more that…the decision to expand the activity. That's the only thing that has to be in a way. It becomes a bigger potential."

"Political forces must rather be that in relation to the speed of development of the wind farms in a way that in relation to potentially more activity it must be the only one."

Additionally participants from company 4 did also verify the need for scaling up the projects. While participant 6 argued that having a home market for offshore wind is crucial for building an industry in it and pointing out that the Norwegian OSV firms have generate the revenues from outside of the Norwegian territorial in offshore wind. Participant 4 acknowledged this in under the interview and also added that *"the Norwegian authorities are in some way involved*

and help us to simply outcompete the Dutch and the Germans." Moreover participant 6 outlined that the political decision-making process and actual project implementation processes need to be accelerated.

Participant 6 presented his perspective as follows:

"When you have a good supply of projects, we also do it in a way that you can scale up. But that's again one of the big challenges in the offshore wind market is the need to scale up in order to be able to create in a way to get a little bit more mass production and thus have better earnings on it because it is."

"That they are our members who are involved in offshore wind. They have had their earnings exclusively outside Norway, more or less because there has been no market in Norway and the domestic market will be quite important to really get the industrial side going."

"But the ambitions are not really connected to the pace at which the development is going, and that is again about, and that is what you kind of need from the politicians."

The sub-theme of project scale was identified as critical for the success of Norwegian OSV firms transition to offshore wind industries. All participants emphasized the need to scale projects and expand activities, which requires a political framework to establish a home market for offshore wind. Participants from different companies also agreed on the need for political support through accelerating the decision-making and project implementation processes. The participants' views highlighted the importance of political support and project scale for the growth of the offshore wind industry in Norway.

A summary of analysis

In summary, the chapter presents a thematic analysis of primary data obtained through semi-structured interviews with six industry experts. The aim was to explore the drivers, barriers, and success factors for Norwegian OSV firms transition from the oil and gas industry to the offshore wind industry. The main drivers identified were green investment, the potential for growth, risk spreading, and transferable competence. However, there were several barriers, such as technical, fiduciary, investment, and credit barriers, as well as activities in the oil and gas industry and a lack of political support in Norway. Finally, the chapter highlighted clear vision, collaboration with customers, appropriate business models, innovation, internal and external communication, and political support as crucial success factors for transitioning to the offshore wind industry and scaling up offshore wind projects in Norway. The table presents the factor disclosed through literature and factors disclosed in thematic coding process. Green color represents new factors from thematic coding which was not mentioned in literatures.

Key concepts	Coded transition factors from primary data
Drivers	Green investment drivers
	Growing market opportunity
	Risk spreading
	Transferable competence
Barriers	Fiduciary duty (short-term profitability
	Low TC rates and margins
	High investment barrier
	High credit barrier
	O&G barriers
	Technical barriers
	Lack of political support
Success factors	Clear and narrative vision
	Capabilities
	Collaboration
	Innovation
	Sustainable business models
	Communication
	Political support
	Project scale
Total number of factors	19

Table 3: Table below presents the results of the thematic coding

6. Discussion

The findings presented in the previous chapter gave valuable insights to identify and explore the **drivers, barriers, and success factors for Norwegian OSV firms transition from the oil and gas industry to the offshore wind industry**. In additional, some factors was also identified in literatures when literature review was conducted. The factor mentioned in the literature was originally presented for transitions in other industries, or for topics such as circular economics, sustainability, and transformation. Therefore was these factors evaluated by the industry experts for determining their relevance and important for this particular segment and topic.

Som transition factors from the literature aligns with the finding and therefore prove their relevance for Norwegian OSV firs transition, while other contradicts with the findings, and some are not mentioned in previous studies. These give interesting insight into the factors that are peculiar for Norwegian OSV firms transition from oil and gas to offshore wind. The objective of this chapter is to discuss these findings in detail and draw conclusion for the factors that affect Norwegian offshore shipping companies' transition to offshore wind**. However it is again worth mentioning that the research objective was to explore and identify the influencing transition factors according to their function (drivers, barriers and success factors) and not to find solutions for their implications.**

Firstly the discussion will start with the transition drivers, and thereafter move to barriers and finally to success factors, before concluding and providing some recommendation for further research.

The identified factors from literature and the findings from data analysis are presented in the table below. Yellow rows highlights the transition factor from literature that contradicts from main findings, while green color highlights new findings.

Key concepts	Transition factors from literature	Main theme from primary data	Sub-themes from primary data
Drivers	Lack of vessels	Economic drivers	Risk spreading
	Increasing freight rate		Growing market opportunity
	Political alignment with supportive policies	Political driver	Green investment drivers
		Transferable competence	
Barriers	Short-term profitability	Technical barriers	
	High investment cost	O&G barriers	
	Lack of knowledge and skills	Economic barrier	Fiduciary duty (short-term profitability
			Low TC rates and margins
			High investment cost barrier
			High credit barrier
		Lack of political support	
Success factors	Clear and narrative vision	Clear and narrative vision	
	Capabilities	Capabilities	
	Collaboration	Collaboration	
	Sustainable business models	Innovation	
	Innovation	Sustainable business models	
		Communication	
		Political support	Project scale

Table 4: The table present the transition factors from literature and from the primary data collection. Yellow=contradicting with findings, Green= new findings.

6.1 The transition drivers

This section will discuss the transition drivers for Norwegian OSV firms as identified through data analysis. The primary driver is related to economic benefits, including growing market opportunities and risk spreading. Additionally, green investment was identified as a political driver, while one driver related to competence has been identified, as the data analysis revealed that the competence acquired by Norwegian OSV firms in the oil and gas industry is transferable to the offshore wind industry. This has been a driving factor for many companies' involvement in the offshore wind industry. In addition all drivers that was identified in literature deviates from this function for Norwegian OSV companies. Although one exception to some degree is green investment, which is consider as a political driver.

6.1.1 Green investment as political driver

Green investment in connection to the Norwegian OSV firms refers to the fact that it is easier to finance a renewable project than a project related to oil and gas projects. This is an inevitable regime-level change that drives the sustainable paradigm shift. For instance, as mentioned in the literature the CBAM measure that is about to be implemented and the Paris agreement are just two example of regime-level factors that influences the driver towards offshore wind. Therefore, such political factors have pressured niche actors to change their activities to more sustainable practices. The data analysis reveals that financial institutes like banks have become far more risk-averse after the oil crisis in 2014. Thereby the banks are more unwilling to lending money to OSV firms that want to invest in O&G projects.

At the same time, it will be easier for an offshore shipping firm to seek funding from the banks for a green project, such as a vessel or equipment for offshore wind projects rather than for oil and gas projects. In connection to the literature review, the lack of vessel for upcoming OWP projects can further increase the day rates and also push the financial institutes to change their behavior towards OSV firms, through political pressure.

The political frameworks and policies push the firms to invest in sustainable practices such as offshore wind. Nevertheless, there is an evident lack of political support to drive a transition of the Norwegian OSV segment, where the political frameworks lack supportive policy tools to manage the transition in an economically variable way. For instance, OSV firms that invested in green technologies had a funding system that had been shut down because the government meant the funding favored the shareholders. At the same time, the system is still available for the fishing segment. This indicates that more standardized policies and

frameworks are needed to facilitate an economically viable transition for OSV firms, which also was outlined as the experts expressed that they need more political support from the Norwegian government.

Overall, green investment policies drive the firms to make more sustainable choices and emerge as a driver for Norwegian OSV firms' transition to offshore wind. At the same time, there are significant need for better and more standardized policies from the political site.

6.1.2 Growing market opportunity and risk spreading as transition drivers

The offshore wind industry is rapidly growing and presents a significant opportunity for OSV firms to capitalize on it. As identified in Chapter 3.2 and through data analysis, the growing market opportunity was discovered as a driver for many participating firms. These firms view the offshore wind industry as an opportunity to generate income and diversify their business into the O&G and OWP markets to spread their risks. Diversification of contracts in both offshore wind and oil and gas can reduce the risk of incurring losses due to market collapse or unforeseen events. In addition to mitigating risk, such diversification can also provide firms with a positive financial outcome by using the income from oil and gas to facilitate an economically viable transition into the offshore wind industry.

The development of worldwide offshore wind projects is accelerating, which means it will compete with the oil and gas industry for the same vessels. This competition can be leveraged by shipowners to increase vessel utilization and push time charter rates upward. The factor lack of vessel in literature review is therefore an underlying reason for increasing time charter rates. However, it is important to note that current time charter rates and margins in the offshore wind industry are not comparable to those in the O&G industry. Therefore, improving margin is a crucial factor that needs to be addressed to increase the involvement of Norwegian OSV firms in the offshore wind industry. Many companies are holding back due to this significant reason.

Despite the current challenges, the turnover of the offshore wind industry is rapidly increasing, presenting a significant profit potential for the future. In particular, the informants suggest that the floating wind farms segment is expected to grow in the coming years, and Norwegian OSV firms can strategically position themselves to capture significant value in this segment. This new segment in the offshore wind industry may be more profitable than the bottom-fixed wind segment. Furthermore, to be a frontrunner and take a leading position in the sustainability transition, companies need to capitalize on the offshore wind industry early. This involves

building strategic partnerships, developing technologies, and appropriate business models. By doing so, OSV firms can take advantage of the growing offshore wind market and contribute to the sustainability transition.

6.1.3 Transferable competence as driving force

The valuable expertise Norwegian OSV firms have developed over the years in offshore operations is at the core of the firms. This competence, consisting of knowledge, skills, and experience, has been a key driver for these firms to adapt their operations to offshore wind as the need arose. For instance under the oil crisis some of the firms quickly utilized their fleet in offshore wind industry. The competencies required for offshore wind projects are similar to those needed in the oil and gas industry, and as such, the firms are able to **transfer their competencies** and apply it to the offshore wind industry.

This driver contradicts the theoretical claim suggesting that offshore companies lack the knowledge and skills required for a transition to sustainability. The data analysis has shown that this barrier from the literature is not valid for Norwegian OSV players.

Despite the high level of offshore competence possessed by these firms, they still face new challenges and barriers in the offshore wind industry. For instance, there are technical barriers related to vessel development for floating wind farms and bottlenecks in developing appropriate business models for generating economically sustainable growth in the industry. These barriers need new competence to solve these challenges, which is crucial for firms to succeed in the offshore wind industry. They can develop it by recruiting people from other industrial domains, such as offshore wind, or collaborating within and across the industries to bring new perspectives. Data analysis revealed that the OSV firms in Norway are using some of these strategies to get new competencies for the transition.

6.1.4 Summary of the transition drivers

This section discussed the transition drivers for Norwegian offshore supply vessel firms toward the offshore wind industry. One is the political driver, which is identified as green investment, making it easier for firms to seek funding for sustainable projects rather than oil and gas projects. However, there is a need for better and more standardized policies to facilitate an economically viable transition for OSV firms. The growing market opportunity and risk spreading also drive firms to capitalize on the rapidly growing offshore wind industry, but there are challenges in improving margins and competing with the oil and gas industry. Finally,

transferable competence is a key driver as Norwegian OSV firms possess valuable expertise in offshore operations that can be applied to the offshore wind industry, though new competencies are needed to solve new challenges and barriers. Overall, these drivers highlight the importance of political support, strategic partnerships, and developing appropriate business models to facilitate a successful transition toward the offshore wind industry.

6.2 Transition barriers

The study contributes to identify the barrier for Norwegian OSV firms transition as well. The 3 barriers that was identified in the literature was also assessed with the expert. The study resulted in identifying 4 economic barriers, a political barriers, a technical barrier and the O&G activities turned out to be a barrier for the transition of Norwegian OSV firms to offshore wind. This section will discuss the barrier that is impeding the transition of Norwegian OSV firms.

6.2.1 Economic barriers and O&G barrier

One of the economic barriers identified in literatures is the focus on short-term profitability which refer to **fiduciary duty** among Norwegian OSV firms that was represented in the primary data collection process. Participants emphasized that their fiduciary duty towards their shareholders is main priority. This present a reasonable barrier for firms transition to the offshore wind industry because this barrier is influenced by the underlying fact that there are **lower time charter rates (TC rates) and lower margins** in the offshore wind industry compared to the **oil and gas industry**. Low TC rates and margins in offshore wind was considered by many experts as one of the biggest barriers.

Oil and gas activities are therefore a significant underlying barrier that hampers the transition. Even if oil and gas activities are a new barrier is highly connected to economic barriers. The oil and gas industry is also a dominant regime in Norway which attracts most of the technological competence in the country and leaves the other industries with a shortage for these technical competences such as ICT, digitalization and other engineering related capabilities. However the experts had an ambiguous perception on the barrier ***lack of knowledge and skills*** that was identified in the literature, but it is prominent that Norwegian OSV segment is having the necessary knowledge and skills for operating in offshore wind industry, because the competence from O&G is transferable to this new industry. The discrepancy between the findings in the literature and the primary findings for the OSV segment may be due to the fact that this niche is a part of the oil and gas value chain, which is

in contrast to other shipping segments such as liner shipping and port authorities that have been researched by Raza et al. (2023) and Pagano et al. (2022).

Despite the dominant influence of the oil and gas industry as a barrier and its implications discussed in the previous two paragraphs, it is important to note that low TC rates remain a significant economic barrier hindering the transition of Norwegian OSV firms into the offshore wind industry. However based on the data analysis, increasing TC rates in offshore wind industry do not mean that the rates are comparable with the oil and gas rates, which again lead to the conclusion that increasing TC rate in OWP was a ***subjective interpretation from me to claim that it can be a driver***. The primary data analysis gave more depth into this point and proved to a wrong interpretation of the facts. For the industry experts, the increasing rates gives positive signals, but again the OWP projects are not scaled up to the level they are profitable, which again makes increasing TC rate irrelevant to be consider as a driving factor.

As long as profit margins remain lower in offshore wind than oil and gas, fiduciary duty will continue to pose a significant barrier for Norwegian OSV firms in transitioning to this industry. It is worth noting that fiduciary duty legally binds companies to act in the best interests of their shareholders (Blincoe, 2022), and this focus on short-term profitability can therefore reduce the willingness of OSV firms to invest in the long-term transition goals to enter the offshore wind industry, as it was highlighted by Sletten et al., 2023.

The implications of fiduciary duty are significant, both for the OSV firms themselves and for the offshore wind industry. By prioritizing short-term profitability over long-term growth and sustainability, OSV firms may delay the opportunities to develop new capabilities and technologies, establish new collaborations, and build a strong foothold in the rapidly growing offshore wind market. In turn, this could slow the pace of the transition to a more sustainable business as Mäkitie et.al (2019) mentioned. However another **economic factor, the investment cost** does also pose a significant barrier in connection with fiduciary duty, as investment in new capabilities and appropriate technologies are met with high cost.

The high investment cost is a significant barrier to the transition of Norwegian OSV firms to the offshore wind industry, as highlighted in the existing literature and confirmed by the experts. This barrier poses a significant challenge for OSV firms, as investing in capital-intensive assets and organizational processes necessary to facilitate the transition is costly which is in consistency with the findings of Sharma et al., (2023) and Shojaeddini et al., (2019).

The technology and vessels required for offshore wind operations are expensive, and their profitability depends on the return on investment, which is currently uncertain due to the low TC rates. The reason for such low rates is that the industry is still unprofitable. According to data collection, offshore wind projects often receive subsidies, which can convince them to prioritize cost reduction.

For example, a seismic or anchor handling newbuilding vessel can cost up to half a billion Norwegian crones, making it a significant economic risk for the firm and the financial institutes. The study of Hessevik, (2022) indicated that oil crisis and pandemic impaired many offshore firms and imposed a risk for companies to invest in new assets. As the reason of the market downturn the banks have become increasingly risk averse and the **credit barrier** are therefore relatively high for Norwegian OSV firms. This barrier certainly hamper the further investment in vessels, technologies and other critical resources for further development within the offshore wind industry. Such a risk adverse behavior from banks are reasonable as many of them have experienced high loss, but at the same time this indicate that Norway need new financial frameworks and policies in order to make a move towards more sustainable businesses. This is again dependent on them regime level factors, such as the political factors in order to succeed with a transition from O&G industry.

6.2.2 The technical barrier

During the interviews, experts highlighted the importance of these factors in the context of the transition to offshore wind. For instance, the industry is still unfamiliar to many Norwegian OSV firms, because it gives them uncertainty regarding the return on investment for such capital-intensive investments. At the same time, the technology in the offshore wind industry is still not matured or standardized, and new solutions are being developing and implementing rapidly. This present a **technical barrier** for Norwegian OSV firms.

For instance, the ships relevant for operation five years ago is irrelevant today because of the rapidly increasing size of wind turbines. Another example is that there are still no standardized anchoring solutions for floating turbines, which poses a significant risk for OSV firms that invest in vessels for current anchoring solutions since after five years when the vessel is ready to enter the market, it might not be fit for such operations. Such technical barrier is therefore connected to the investment cost as well and poses a significant implication for investing in technologies and resources for offshore wind industry. Therefore this barrier creates numerous

technical obstacles that must be addressed before these firms can fully embrace the transition. This barrier was addressed in literature presented in chapter 3.2.1 to some extend where it is clear that the different vessel requirement in OWP compared to O&G will create challenges (Palmer, 2021). At the same time, the findings proved that Norwegian OSV firms are capable to carry out the operation of OWP Projects safely and that they have the necessary competence to operate in this industry, which contradict this the literature.

Therefore, multiple underlying economic risk factors and political factors are associated with investing in such assets, also including profitability, offshore wind project supply, and the offshore wind industry's technological and institutional maturity.

The risk associated with such capital-intensive investments is a significant barrier for Norwegian OSV firms. So far, as observed through interviews, it seems like there is a lack of constructive **communication** and **collaboration** between the offshore cluster and the Norwegian government (politicians and policymakers). Since some of them are expressing that politicians often do not listen to the firms and are still slow in accelerating the offshore wind development projects. Considering this the **lack of political support** a significant barrier to the transition of Norwegian OSV firms to the offshore wind industry.

6.2.3 Lack of political support

The analysis shows that there are lack of political support to facilitate a smooth transition for Norwegian OSV firms. however, this is contradictory to how literature review, where political support was interpreted as a driver, similarly to TC rates. The studies of Normann (2015) Roux et al. (2022) outlined how insufficient political supports led Norway and Ireland fail their attempt to capitalize OWP. However these cases where relatively od and since the international politics in recent years had engaged to support renewables, it was therefore interpreted that there was enough political support for Norwegian OSV firms as well. it has been proven wrong by the experts from Norwegian OSV segment. Rather they was clearly indicating that both international and national supports regarding taxation regulations, funding systems and predicable frameworks when competing with international players could all be improved.

In summary of transition barrier, it is clear that the economic-, technical- and political barriers hamper the transition of Norwegian OSV firms towards offshore wind. The barriers also affect each other and make it even more complicated for the companies to manage the challenges they create.

The economic barriers, such as the fiduciary duty and high investment cost, align with previous research and show that they are also transferable to the Norwegian OSV firm transition. While Low TC rates and margins and high credit barrier is new findings that emerged from data analysis. As explained, low TC rates and margin barrier contradict the literature that has been reviewed and shows that increasing the freight rate is not a driver for the firms since the TC rates are still lower than those in the oil and gas industry. Therefore oil and gas activities are a significant barrier to the transition of these firms to offshore wind. At the same time, the technical and political barriers are also new findings where the political barrier contradicts the literature.

6.2.4 Summary of barrier

Norwegian OSV firms seeking to transition to the offshore wind industry face numerous barriers that hinder their efforts and also willingness. One of the barriers is the fiduciary duty that prioritizes short-term profitability over long-term growth and sustainability, making it difficult to invest in capital-intensive assets and organizational processes. Low time charter rates and margins in the offshore wind compared to the rate in the O&G industry further exacerbate this challenge, along with the high investment cost required for new capabilities and appropriate technologies necessary for offshore wind operations.

The transition is also hindered by political barriers, as there is a lack of constructive communication and collaboration between the offshore cluster and the Norwegian government. The absence of political support regarding taxation regulations, funding systems, and stable frameworks when competing with international players is a significant barrier to the transition of Norwegian OSV firms to the offshore wind industry.

6.3 Success factors

The success factors identified in the literature were all mentioned by the experts and are critical for the transition of Norwegian OSV firms to the offshore wind industry. These factors include a **clear and narrative vision, capabilities, collaboration, innovation**, and a **sustainable business model**. In addition, three other factors emerged from the data analysis: **communication, political support**, and **project scale**. These factors will also play an essential role in the success of the transition.

6.3.1 A clear and narrative vision

A clear and narrative vision is crucial for companies looking to transition towards more sustainable business (Long et al., 2018)., as it provides the backbone for navigating through in transition. Without a clear vision, other success factors, such as building dynamic capabilities or collaborating with external organizations, become much more challenging. For instance, a vision that take offshore wind into account for the firm's operation can drive the companies to innovate and develop technologies that capitalize on offshore wind opportunities. However, the interviews with experts revealed that many OSV companies do not have a clear vision for sustainable business. Instead, they make strategic decisions to increase their involvement in the offshore wind. The data collection process also revealed that some Norwegian OSV firms are not planning to capitalize on the offshore wind industry at all, as they do not consider it profitable enough.

Nevertheless, a clear vision is essential for communicating with external stakeholders, such as customers, governments, and the public (Long et al., 2018). It enables companies to express their long-term goals and follow a trajectory toward more sustainable business practices, as Hernández-Chea et al., (2021) concluded in their research. Forming such a vison can be extra important for offshore wind industry as the OWP projects are characterized with long project lie and the actors might look for partners and alliances what are communicating that they will stay in the industry as a stable players. Company vision that shows this characters can help to gain more costumer and build better network in the offshore wind industry.

This is also becoming increasingly important due to global climate goal targets, such as the UN and EU's sustainable development goals and new regulations to reduce carbon emissions, e.g CII and CBAM. Without a clear vision, companies may struggle to adapt to stricter regulations and lose opportunities to capitalize on the growing offshore wind industry and the demand for sustainable business practices. Therefore, a clear vision communicating the transition plays a

significant role in capitalizing on market opportunities and forming a trajectory towards a transition to sustainable business areas, such as offshore wind. By doing so, companies can position themselves as leaders in the transition to a more sustainable future while also meeting the demands of customers, governments, and society. Based on this, the Norwegian OSV firms that are planning to capitalize offshore wind is recommended to revise their vison in order to succeed in the new energy industry.

6.3.2 Capabilities and collaboration

The success factors of **capabilities** and **collaboration** are crucial for companies transitioning to the offshore wind industry. The literature review demonstrates that these factors are highly interrelated and are vital in facilitating a successful transition as Loorbach & Wijsman (2013) outlined. By gaining more knowledge, skills, and competencies through collaboration with customers, other OSV firms, politicians, and policymakers, the firms can enable the innovation necessary for the transition. The data analysis in this study revealed that Norwegian OSV firms emphasize necessary knowledge, skills, and competence and need to continuously improve to capitalize the offshore wind. Because for new entries, the knowledge about the market can be limiting factor in order to evaluate the risk, calculate economical viabilities and to develop an appropriate business model, as many participants also expressed.

Moreover, the Norwegian OSV firms possess valuable capabilities gained through their extensive experience in the oil and gas industry, particularly in harsh geographical locations such as the North Sea. These capabilities include safe operations, technological advancements, and strategic partnerships, which are critical for success in the offshore wind industry. With these capabilities, they are well-positioned to levelize this factor and capitalize on the opportunities presented by offshore wind. Also Gorissen et al. (2016) confirmed that the capabilities of people are critical in order to succeed with the transition. The data analysis shows that the firms highly value and trust their capabilities and therefore predicts that Norwegian OSV firms will play an essential role in the future of the Offshore wind industry.

Furthermore, collaboration does not only enable firms to develop new capabilities and facilitate innovation, but it also allows for the reevaluation and correction of the transition trajectory according to needs. For instance, better collaboration with offshore wind developers and operators can provide solutions to uncertainties surrounding floating windfarms, which are currently a major challenge. Moreover, most SOV vessels in use today are not fit to carry out

operations for floating wind, as it requires larger and more advanced vessels. Such challenges can be overcome through better collaboration with a diverse network of actors, and thereby the firms can reinforce the transition trajectory. This example consist with the literature that argues collaboration will enable cross function learning and further fuel a successful transition (Bag & Rahman, 2021; Gorissen et al., 2016; Loorbach & Wijsman, 2013)

Norwegian OSV firms face one major challenge related to collaboration. One of the most important is the lack of collaboration between the OSV firms, or the shipping industry in general, and the Norwegian government. With collaboration with the government, firms may be able to scale projects, develop better frameworks, and receive adequate support to compete with international actors who have good support from their governments. Norwegian OSV firms must prioritize collaboration with the government and other stakeholders to develop effective solutions and succeed in the offshore wind industry. Collaboration is therefore a significant success factor for Norwegian OSV firms that should not be overlooked. By fostering collaboration and developing arenas for collaboration, these firms can position themselves as leaders in the transition to a more sustainable future and capitalize on the growing demand for offshore wind.

6.3.3 Innovation and business model

Innovation is a success factor for the transition of Norwegian OSV firms from oil and gas to the offshore wind industry. This is because transitioning from one dominant regime to another requires a shift in regulations, infrastructure, business models, and technologies (Bidmon & Knab, 2018). Without innovation in these areas, it will be challenging for Norwegian OSV firms to gain a leading position in the offshore wind industry. Innovation in new vessel technologies, business models, and policies is crucial to address the industry's technological challenges, not only for the wind turbines but also for vessels that need to handle more advanced operations as offshore floating wind commercializes. Norwegian OSV firms can leverage their existing capabilities and collaborate with other industry players to generate new innovative solutions as they already possess a high level of knowledge and competence, as Borch and Solesvik's (2015) discussed in their research.

The data analysis highlights the importance of new **business models** as many firms struggle to understand the market and find appropriate ways to add value to prove to their customers. Norwegian OSV firms must be innovative and develop sustainable business models to

capitalize on the growing market and generate sustainable revenue. For instance, EPCI-alliances, where the firms work closely with bigger companies vertically or horizontally within the value chain to gain more access to offshore wind projects. Norwegian OSV firms could also consider integrating part of the value chain into their business, providing end-to-end or more integrated services, which can help generate more revenue (Löhr & Mattes, 2022).

It is clear from the literature review and data analysis that having an appropriate business model will be a crucial success factor for the transition of Norwegian OSV firms to the offshore wind industry. Developing innovative business models will enable them to capture the growing market, generate sustainable revenue, and take a leading position in the offshore wind industry. Therefore, Norwegian OSV firms must focus on developing new business models through innovation to achieve a successful transition.

6.3.4 Communication and political support

The analysis of the coded data revealed that **communication and political support** are crucial factors for success in the offshore wind industry. Internal communication is essential to ensure that all staff members know about the involvement in more sustainable industries. External communication, through various channels such as corporate presentations and the company website, promotes the company's initiatives in renewable energy and increases awareness of their involvement in offshore wind. Maintaining an open communication culture is also important, mainly when dealing with new customers and building a new network.

Political support emerged as another important theme in the analysis, with the participants highlighting the need for more interaction between the Norwegian government and the shipping industry. The data analysis showed that the support of the Norwegian government and politicians would be crucial in capitalizing on the offshore wind industry, where competition is high with other OSV firms that receive support from their governments, such as Germany and the Netherlands. It is clear that better political support in terms of more stable regulatory frameworks, legislation, and policies related to offshore wind businesses is absolutely a critical factor for the Norwegian OSV firms to succeed in offshore wind.

The need for more political support indicates that there should be better communication and collaboration between the parties. Therefore, creating common transition arenas where politicians, OSV firms, and OWP firms can interact would allow the parties to develop common goals and visions for the transition. For example through communication in such

arean could the parties address solutions for technical barriers, a home market for OWP, and faster decision-making measures. The idea of a transition arena where different stakeholders are invited to address and find common solutions has been successful in the Netherlands, Germany, and Belgium to manage transition-related challenges (Bramati, 2016; Gorissen et al., 2016). Therefore, such an initiative could increase the collaboration and political support to the OSV segment.

6.3.4.1 Project scaling

Norway government newly announced tender for 2 offshore wind farm development areas, namely Utsira Nord and Sørlig Nordsjø II. However the government also outlines that they have ambitions to build offshore wind farms with a capacity of 30 GW before 2040 (energidepartementet, 2023). This indicates that the ambitions of politician are high, but taking this into a bigger picture, it shows that countries with less suitable environment, capabilities and infrastructure such as Belgium have managed to develop more OWP capacity than Norway (*Belgian Offshore Wind Energy*, n.d.). This gives a clear picture that even if the natural resources and experience and capabilities of Norway is internationally competitive, the industrial players, among other OSV firms will struggle to transit their business to offshore wind without enough projects on home market, where they can have a competitive advantage over other international actors.

Norwegian politicians are lagging behind other countries in decision- making process for offshore wind in Norway. The available natural resource and capabilities alone is not enough for the market to be profitable as long as the project volume is not increasing. Scaling up the project supply can help the OSV firms to capitalize on experience and capabilities in order to take a leading position in the industry. project scaling is therefore an important success factor for the transition of Norwegian OSV firm to offshore wind industry.

6.3.5 Summary of the success factors

To summarize, the success factors for Norwegian OSV firms in transitioning to the offshore wind industry are transition-focused clear and narrative vision, collaboration, innovation, appropriate sustainable business model and political support. A transition-focused vision can help promote innovation, collaboration, and communication of transition goals internally and externally. Collaboration with customers, politicians, OWP actors, and other OSV firms can help gain knowledge and enable innovation. Norwegian OSV firms must find innovative business models, and technologies to succeed in offshore wind.

Developing new business models through innovation is crucial for Norwegian OSV firms to capture the growing offshore wind market and achieve a successful transition. Effective communication and political support are critical for success in the offshore wind industry, and scaling up the project supply is important for Norwegian OSV firms to capitalize on their experience and capabilities in order to drive a profitable business in offshore wind industry. Overall, the transition of Norwegian OSV firms to the offshore wind industry is dependent on the resented success factors, and the firms might need comprehensive strategical actions in order to succeed with their gradual transition to offshore wind industry.

6.4 Research limitation

Although this study has provided valuable insights into the research topic, there are several limitations that must be acknowledged and addressed. This section will outline these limitations and their potential impact on the generalizability and validity of the findings.

Firstly, the sample size of this study was small, as only six experts from five firms participated in the data collection process. As a result, not all types of offshore shipping companies were represented, which may have limited the extent to which the findings can be generalized. For instance, if a particular company type was not included, the degree to which transferable knowledge can be a driver for that type of company remains unclear. This limitation could question the credibility and of the findings.

Secondly, data collection was performed in different languages, with the first interview conducted in English and the second in Norwegian. While the participant who conducted the interview in English was comfortable with the language, this may have affected the raw data. Additionally, the translation process required manual rewriting due to certain terms,

abbreviations, and linguistic variations that led Teams transcription function to mis-script some information. However, these discrepancies were manually corrected.

Thirdly, the data analysis process could have been affected by subjective interpretations. Although Nvivo was utilized to ensure the quality of the data analysis process through thematic analysis, some information could have been avoided or subjectively interpreted. For instance, it was sometimes difficult to distinguish whether a factor was a barrier or a success factor. In this regard, personal experiences and knowledge may have influenced the findings. This was especially true since the data collection methodology utilized was a semi-structured interview, allowing participants to freely discuss factors without being interrupted, which led them to reveal the transition factors without a chronological order. This created some challenges in distinguishing the factors, especially barriers form success factors.

7. Conclusion

In conclusion, this exploratory study has contributed to explore **the drivers, barriers and success factors that affect the transition of Norwegian offshore service vessel firms from oil and gas to offshore wind industry**. The study has identified four drivers, seven barriers, and eight success factors that need to be considered for a successful transition.

This study's research findings indicate that the foremost drivers for transitioning Norwegian OSV firms to the offshore wind industry are economical. These drivers include growing market opportunities, risk spreading, green investment, and transferable competencies. Conversely, the study has also identified several barriers that inhibit this transition, predominantly economic barriers such as fiduciary duty, low time charter rates and margins, high investment costs, and high credit barriers. Additionally, the profitability of the Oil & Gas industry relative to the offshore wind industry serves as a barrier to this transition for OSV firms. In addition, technical barrier and lack of political support hinder the transition further. Lastly, the study reveals that the success factors for OSV firms in this transition are having a clear and narrative vision, strong firm capabilities, collaboration, innovation, sustainable business models, communication, and political support, and also scaling the projects will be critical for the transition of the firms- project scale. The table 5 summarize the transition factor for Norwegian OSV firms.

Drivers	Barriers	Success factors
Growing market opportunity	Fiduciary duty	Clear and narrative vision
Risk spreading	Low TC rates and margins	Capabilities
Green investment	High investment cost	Collaboration
Transferable competence	High credit barrier	Innovation
	O&G barriers	Sustainable business models
	Technical barriers	Communication
	Lack of political support	Political support
		Project scale (expand projects supply)

Table 5: The transition driver, barriers and success factors are organized in the table.

Chapter 6 highlights the interconnectedness of the factors involved in the transition of Norwegian OSV firms from the oil and gas industry to the offshore wind industry. This interdependence can make managing the transition even more challenging. However, the primary objective of this exploratory research paper is to identify these factors rather than addressing their connections or level of impact on the transition. Thus, a potential research problem for future studies would be to assess the interconnections and their impact on the transition of Norwegian OSV firms.

The data analysis reveals that certain areas received more attention from the experts and piqued their interest. Particularly, the need for a sustainable business model was emphasized, as the OSV firms need to find appropriate solutions for capitalizing on the offshore wind industry, especially when floating offshore wind farms become commercially viable. Another area of interest was the lack of political support, and the experts stressed the need to improve the relationship between OSV firms and politicians. As the transition to the offshore wind industry will be a gradual and long-term process, a healthy relationship between the government and the OSV segment is critical.

Finally this study has contributed to the existing body of knowledge in the field of transition management and sustainability in the Norwegian OSV segment. Furthermore, the results of this study provides valuable insights into the factors that affects Norwegian OSV companies as they navigate through the gradual and long-term transition from the oil and gas industry to the offshore wind industry.

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Appendix 1- interview guide

Introduction

1. Could you briefly introduce yourself, your background and your current position?

2. Can you tell us briefly about your company and your experience in the offshore wind industry?

Drivers

3. What are your interests in offshore wind and what is your motivation for going into offshore wind?

4. What are some of the opportunities you see in the offshore wind industry for your company?

5. What steps have you taken or are you considering taking to enter the market?

Success factors

6. In your experience, what do you think are the key factors for a successful transition from oil and gas to offshore wind?

7. What measures or strategies have you implemented to ensure a successful transition and how have these worked for you so far?

Concluding questions

8. How do you envision the role of Norwegian offshore shipping companies in the global offshore wind industry?

9. Is there anything else you would like to add that might be useful to know?