



Master's degree thesis

LOG950 Logistics

The Economic Impact of a Flexible Strategy: A Case Study of a Service Provider to the Oil and Gas industry

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Number of pages including this page: 73

Molde, 23.05.2022



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Foreword and Acknowledgements

This Master Thesis is the final requirement of Molde University College's Master of Science in Logistics program. The research was carried out between December 2021 and May 2022, finishing the Logistics Master's degree.

We would like to give special thanks to our supervisor, Berit Irene Helgheim. Your experience, knowledge, and candid opinions have been a tremendous help to us, keeping us motivated and pointing us in the right direction, and we appreciate it greatly. We would also like to thank Halvard Arntzen for helping us out with the data and confirming that our methodology and findings were done in the right manner. We would also like to thank Therese Monsås, Håvard Bjerkeli, Richard Haukebø, and Rune Jacobsen, for letting us work with them and allowing us to use their data for our thesis. This master thesis would not be possible without you and the time you have given us throughout this spring. We are very grateful to them for their open-mindedness when welcoming two master's students.

At last, we would also like to thank Molde University College and all the professors and teachers lecturing and advising us. You have given us a lot of knowledge in many different areas of society, and life itself.

Thank you all!

Bjørn Erik Langstein and Runar Berg
Molde, May 2022

Abstract

Purpose: This paper aims to investigate the impact a flexible strategy has on the economic performance of a service-providing company in the oil and gas industry. Six variables of flexibility have been considered in the investigation. These variables are *turnover flexibility*, *offshore flexibility*, *personnel flexibility*, *mobilization flexibility*, *onshore flexibility*, *rent flexibility*, and *profit margins*.

Design/methodology/approach: The data have been collected from the case company's ERP systems and contain 90 different projects with three different customers and four workgroups. We have used a cross-sectional design regression model.

Findings: Results from this study indicate that a flexible strategy has a positive impact on economic performance through increasing turnover. There is also an indication that the *profit margins* are staying the same when increasing turnover.

Originality/value: This study is one of the first empirical studies concerning the economic impact of a flexible strategy for a service provider to the oil and gas industry. The authors contributed by filling a gap in the literature by collecting empirical evidence on different flexibility variables impacting the economic performance of a flexible strategy.

Keywords: Flexibility, service industry, oil and gas, economic performance, uncertainty.

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Abbreviations

SDØE - Statens direkte økonomiske engasjement

HSE - Health, security, and environment

EOC – Enterprise of competence

LEC - Lifting equipment certification

DREQ - Inspection of Drilling equipment

DROPS - Prevention of dropped objects

MH - Material handling

SLO - Safe lifting operations

QC - Quality control

AIM - Advanced inspection methods

NDT – Non-destructive testing

SIM - Structural integrity Management

MM - Maintenance management

RBI – Risk-based inspection

SOW - Scope of work

AD HOC - Unplanned work

HR – Human resource

ERP system – Enterprise resource planning system

PF – Personnel flexibility

MF – Mobilization flexibility

ONF – Onshore flexibility

OFF – Offshore flexibility

RF – Rent flexibility

TF – Turnover flexibility

PM – Profit Margin

NOK – Norwegian kroner

M1- Model 1

M2 – Model 2

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1.0 Introduction

The concept of flexibility has sparked a lot of interest in most industries over the last decade, helping businesses to handle uncertainty in the face of increasing client demands (Chieh-Peng et al. 2015). In today's market, there is increasing competition with accelerated technological breakthroughs, shrinking product cycles, and a progressive increase in globalization which invites more companies into different markets. This makes for a business environment in a constant state of flux due to its continuous variation from the external environment. A firm's ability to be flexible to adapt to the environmental factors, and reconfigure strategically to change direction is therefore a crucial factor for a firm's survival by obtaining a competitive advantage (Hitt, Keats, and Samuel 1998).

Scholars and practitioners have broadly studied how service operations are faced with a high level of uncertainty where it's argued that flexibility is essential in many aspects of customer value creation (Brozovic, Nordin, and Kindström 2016, Skålén et al. 2015). Dreyer and Grønhaug (2012) refer to flexibility as "an organisation's ability to provide rapid response mechanism to uncertainty while simultaneously being adaptive to changes in the environment". Authors state that flexibility is an adjustment to service operation capacity, and the ability to deliver customized services rapidly (Arias Aranda 2003, Sanchez and Heene 1997). Recent studies do not only emphasize the importance of flexibility, but they also argue how vital flexibility is for improved performance and sustainability of a firm (Lucianetti et al. 2018). Scholars in organizational and strategic management state that one of the more critical roles of the management of an organization is to develop the firm's needed capacity to be able to respond quickly to the changing customer demands and emerging market opportunities or market threats (Gibson and Birkinshaw 2004, Oktemgil and Greenley 1997).

Business services stand for a large portion of the growth in the global service economy, where the fast economic growth coincides with the shift from domestic production and over to outsourcing services globally. Today, the trade of business services across borders has become an important driver in the world's service sector growth (Wirtz, Tuzovic, and Ehret 2015). This can be a strong factor in the ever-growing harsh business environment where companies are facing strong competition which makes flexibility a well-desired capability for a firm to possess (van der Aalst 2013). Service operations

need a paradigm shift towards adaptability and customer orientation. Brozovic, Nordin, and Kindström (2016) state that flexibility is just a natural part of service activities and operations. Moreover, this link is a fragmented manner on different fronts without a clear target (Verdu, Llorens Montes, and García-Morales 2004). This requires complex coordination between different organizational and external resources. Past studies barely mention that flexibility is a mere requirement for a firm to become more customer-orientated, by developing improved service capabilities and being willing to do adjustments regarding customers' needs (Fernando, Chiappetta Jabbour, and Wah 2019, Heinonen et al. 2010). The flexibility level of a service organization is more than just a consequence of offering, it is also about the firm's strategy, behaviour and culture which also needs to be shaped. Lately, that perspective of service flexibility is leaning more toward identifying different regions of flexibility to be able to offer fascinating value propositions and establish sustainable capabilities (Skålén et al. 2015, Ostrom et al. 2015).

The case company are providing services to the oil and gas industry. It is a well-known fact that in this industry, it's the oil and gas producing companies that have the market power. Manufacturing flexibility and non-financial performance in the service industry is a well-researched topic, while research on the impact a flexible strategy has on the economic performance of service providers for the oil and gas industry is missing in the literature. This paper is therefore intending to fill the gap in the literature by answering the following research question:

How does a flexible strategy impact the economic performance of a service provider to the oil and gas industry?

1.1 Structure of the thesis

This thesis is written in a research paper format, this includes two parts. Part 1 is an introduction to the research paper in part 2. Firstly, chapter 2 is providing an overview of the Norwegian oil and gas industry, while chapter 3 is providing information about the case company. Chapter 4 is providing a theoretical framework for flexibility in different industries and the different flexibility strategies. In chapter 5 we are providing a case description explaining how the case company uses their strategy to exploit the uncertain market of the oil and gas industry. Chapter 6 thoroughly describes the method and data used to answer the research questions. Finally, part 1 is ending with a summary of the research paper, which is presented in part 2.

2.0 The Norwegian energy industry

In 1969, Philips informed the Norwegian government about the discovery of “Ekofisk” which turned out to be one of the largest oil reserves ever discovered at sea. This marked the start of the Norwegian oil adventure, and the production started in 1971 at the Ekofisk platform on June 15th, 1971, using subsea solutions. In the following years, there were several major findings were found on the Norwegian continental shelf. The first findings were in the southern parts of Norway, while they slowly opened for more searching across the entire length of the country led to the discoveries of Statfjord, Gullfaks, Oseberg, Troll, Åsgård and the Snøhvit field. The last oil field discovery was the new giant oil field in the North Sea called Johan Sverdrup in 2019, which is said to be able to produce around 1.8-2.9 billion barrels of oil over the next seven decades (Norskpetroleum.no 2022b). These oil fields are divided into sea areas which are the North Sea, the Norwegian Sea, and the Barents-sea.

International foreign companies were dominant in the exploration, being the ones in charge of the development and extraction of the resources. Eventually, the Norwegian engagement increased, and Norsk Hydro entered the market with Saga Petroleum as well. When this happened, Statoil was founded with the principle of having 50 per cent state participation in each permit for extraction. As the oil and gas production developed towards and through 2000, the industry located on the Norwegian continental shelf became more privatized and the Norwegian companies involved in the production started operating more as private companies than as state companies with Statoil becoming stock listed and the sale of “statens Direkte økonomiske engasjement” (SDØE) shares to Statoil was an important aspect to this happening. The petroleum industry has had a major impact on the economic growth seen in Norway. Even now and in the future with more focus on greener solutions, the petroleum industry in Norway will have a major impact on the nation's economy and the industry around it by adapting to new and more innovative ways to produce oil and running the fields, and in newer times, innovating into more renewable energy solutions (Norskpetroleum.no 2022a, Regjeringen.no 2021).

The subsea wells stand for about half of the oil and gas production in Norway, but the offshore technology value did also get transferred over to other sectors such as aquaculture, seabed mining and offshore wind power farms. Therefore, we can argue that

the offshore oil and gas industry has provided a basis for new innovations and further industrial development (Gjerde and Nergaard 2019).

When this industry emerged and developed, other supporting industries had the opportunity of being born, supporting the main industry. This industry is Norway's second-largest in terms of turnover and consists of more than 1100 companies. Through a long time of experience in the industry, the different companies have developed new and innovative technology and are the leading experts in their field. Meaning that these companies do not only operate in Norway but also internationally. Throughout the years, these companies have become leaders in different segments, such as Asset Integrity Management, engineering solutions and technological solutions for the energy industry. Norway therefore moved from being a nation that imported most of its underwater technologies, to becoming one of the worldwide leading exporters of underwater technologies and solutions in 2019 (Gjerde and Nergaard 2019).

When an industry, such as the energy industry is growing, it opens for several industries, ones that can benefit from it directly, and industries that benefit from it indirectly by increased activity, such as IT, food services, washing services and other supporting functions for different activities. These functions and services gain an increase in turnover when activity in various industries increase. The need for services, such as food, hygiene, transport, and personnel will occur when industries find new ways in producing more and increase their activity (Norskipetroleum.no 2022a).

The service and supply industry has developed by having the basis of a country with proud traditions within industry and shipping. With the Norwegian government including thorough health, security, and environment (HSE) requirements and strict legislation, the Norwegian companies have found new solutions and cutting-edge technologies through innovation. With the Norwegian continental shelf being one of the world's largest offshore markets, the companies working here are provided with a large domestic market to supply. The industry is highly reliant on oil and gas prices, having a major downfall in 2014 when the oil prices were falling. Nevertheless, these companies are now optimistic about the future, cutting costs and increasing efficiency through the oil crisis, increasing their competitive advantage. With new markets, more advanced technologies and new ways of operating, the service industry has immense opportunities for development and expansion.

Different parts of Norway have different areas of expertise, with subsea, education, engineering, seismic, drilling, and maritime companies working as different synergies to create value for their market (Fortunebusinessinsights.com 2020).

3.0 Background of the case company

The case company is a global actor in the market of Asset Integrity Management, engineering and technological solutions for the oil and gas industry. Prevention of downtime is a major focus within the industry due to large economic consequences. The case company provides their services through different solutions of asset integrity by discovering errors before they occur, doing this by controlling and monitoring equipment essential for the operations of their clients. Clients for the case company are major drilling companies and operating companies. The company consists of different departments with various specialities or business areas. We can divide the case company into five business areas that includes different expert areas: certification and inspection management, engineering solutions, maintenance management and risk-based inspection, quality control and structural integrity management.

Inspection management and certification is a department that has several different specialities, those specialities are DREQ (drilling equipment inspections), LEC (inspection and certification of lifting equipment) and DROPS (prevention of dropped objects). Inspection and certification of lifting equipment are to perform periodic inspections, certifications and re-certifications. To prevent dropped objects, a DROPS sweep is being performed by the case company. This is when specialized personnel perform these sweeps or correct findings found in prior sweeps. Engineering services consist of different solutions used for different situations. These services can be material handling, safe lifting operations, electric solutions or crane solutions. Modifying and/or maintaining cranes is one of the case company's most important services, the design and analysis of complex structures and solutions is an important part. Companies often have external fabrications and testing methods from other sub-supplier, our case company is therefore performing quality controls (QC) of this work. Advanced inspection methods (AIM) are including several different services such as risk-based inspection (RBI), often including long-term inspection programs that are based on the various risk assessments that are needed for the

different clients. Non-Destructive Testing (NDT) is a method used for testing the integrity of different constructions using ultrasonic or radiographic tools.

As a company in growth, the case company also need to grow as an organization. When revenues increase, the organization also needs to become ready for this growth. A small organization can't handle the revenues and turnover of a large company. When looking into their organization, the case company saw some improvement points that were important to them. These improvement points were within their way of running their projects, the supplier relationships, and the ability to track and trace their environmental footprint (Berg and Langstein 2021).

The case company's Asset Integrity Management department provides services to the oil, gas, and renewables industry by performing quality inspections of lifting equipment, cranes, pipes and more for oil platforms, gas installations, wind farms, ships with more. The way they operate is by using human resources to operate specialized equipment to perform these tasks. This type of survey and certification requires highly qualified engineering personnel. The case company uses a pool of their own engineers and hired personnel to perform the scope of work demanded by its clients.

The employees of the case company say that a lot of their competitive advantage comes from being flexible by meeting fluctuating customer demand fast and efficiently. Meaning that a lot of the work the case company is doing isn't always planned. Some of the projects they send out personnel to perform can have as little as 1-2 days of planning time. Therefore, flexibility is an important aspect for the case company to maintain a good and close customer relationship to be prioritized before their competitors and to create value for both parties.

3.1.1 Project process

Projects in the case company are executed in teams that are cross-functional and a project manager is responsible of running the project. According to Appelbaum, Nadeau, and Cyr (2009), this is called a matrix company or a matrix organization. The projects are tailored and adapted to fit different customer needs, specific quotations and purchase orders presented for the given project. The case company conduct various projects that relates to certifications, annual controls, fixing and improving of different equipment and tools used

at platforms offshore. Moreover, they also perform quality control through reviewing documentation and drawings that specific customers wish to improve, modify or replace equipment or solutions. Project templates are created for project managers to have a common understanding of how to run projects even though most projects are different. Each project is started by either making a frame agreement with a customer or creating a quotation for them to review. If the agreement is met, the project starts by receiving a purchase order from the customer. Often the project manager is involved in the phase of creating a quotation and therefore knows what is demanded from the project and needs no further briefings. When they know the project is confirmed, the next step is to find fitting personnel to perform the given task. This is done by contacting the coordinating personnel for the given department.

During the planning and execution of the project, the project team, manager, and customer all have close contact to coordinate, agree and solve possible issues. The work is performed in different locations either onshore or offshore. When the project is conducted and finished at the site, the executing personnel and the project manager need to finish the documentation and reporting. The degree of documentation and reporting may vary, depending on the type of project. Some projects have a high degree of workload when it comes to reporting and documentation, while others have less demand for reporting. The project is usually completed when the documentation, reporting and invoice are delivered to the customer, but there may be some errors that still need to be addressed.

3.1.2 Service providing company

The case company will inevitably meet different challenges as a service providing company compared to those of a manufacturing company. This might be because a service company sells an invisible product in the form of a service and not a physical product most of the time. Another important aspect to remember is that production and consumption are happening simultaneously in the service industry, while these two are clearly separated in the manufacturing industries (Sonmez and Moorhouse 2010).

Many of the services they offer are individual and required adaptability from the case company even though a lot of projects have the same checklists and the same scope of work (SOW), they are still not all the time. The reason for that is the unexpected and unknown factors that might show up, depending on which customer, location, and

installation they are serving. The quality of the service is highly dependent on the engineer performing the task on the case company's behalf. So, the case company will still be responsible for the quality they deliver even if they outsource or hire personnel to perform the task.

Planning time for each project varies a lot where some projects are what they call annual projects, which are projects they have time to plan for before mobilization, while others are urgent and can have less than one day of planning time. The project engineers and the customer do often plan together to find the best solutions for the different problems. The service provided will to some extent always be tangible through reports, checklists, and drawings. However, it differs from manufacturing with large differences in the perceived quality of the service provided and it's more difficult to measure the actual performance of the delivery in the service sector since the overall impression can vary to a high degree from customer to customer. Certificates, reports, and documents delivered are drivers of the outcome of the delivered service, moreover, the expectations of the customer can also to a large extent vary and therefore control the result as well.

3.1.3 Supplier structure

The case company does not have any manufacturing departments in-house as they are a service provider to the oil and gas industry, so their supplier base helps them to deliver different services, such as travel services, transport services, and hiring of qualified personnel from subcontractors.

The biggest suppliers are the companies that provide human resources for the case company, and they have made agreements to hire qualified human resources to perform the project tasks on behalf of the case company. Demand is often fluctuating and uncertain in some periods, where the maintenance and service demand are extremely high, and other times lower. That is why the case company is using suppliers of human resources to handle the fluctuating demand in a suited way if they don't have the right capacity on hand to handle the demand peaks uncertainty, thus having the right capacity when the demand is low.

The case company purchases services and Sonmez and Moorhouse (2010) state that services can be divided into two categories, professional services and other services. Professional services are services such as consultancies within different professions, while other services may be services of a more administrative sort, such as cleaning services. Purchasing of services differs from purchasing products through a higher degree of complexity in the entire purchasing process.

4.0 Theoretical framework

Research and knowledge are developing rapidly, and it can be difficult to keep track of the newest and most up to date research and knowledge in different areas. That is why we must do a review of the current theory and literature that is done, to collect and synthesize previous research to gain a holistic understanding, allowing us to better address our research question and answer it in a good way (Snyder 2019). To turn a literature review into a proper research method and answer research questions correctly, one must follow specific steps to ensure that the review is accurate, exact, and trustworthy, providing an overview of a particular issue or research problem.

Several research questions can be answered by the method of a literature review. There are several different approaches to conducting a literature review, the approaches can be qualitative, quantitative, or mixed-method design, depending on the phase of the review and other aspects. The different types of literature reviews are systematic review, semi-systematic review and integrative review (Snyder 2019). According to Xiao and Watson (2019), literature reviews can take two different forms, one being the form where the literature review is a background for an empirical study and the second one being a stand-alone piece. The background reviews are often used to justify decisions made in the research design, provide theoretical context, or identify a gap in the literature that can be filled. The stand-alone review often tries to make sense of the existing literature by aggregating, interpreting, or explaining existing research.

For the matter of this thesis, we are performing a background review with a focus on providing theoretical context and identifying gaps in the literature which we can fill. One of the main reasons for conducting a literature review is to enlighten researchers on what is already known. The goal is that the literature reviewed fits into the research we are going

to perform, seeing how different research relates to our study and research questions. By utilizing the sources that substantiate the presence of our problem in the review, it will enable us to gain a solid argument needed for our study. For the research to be definitional, it must add to the current body of knowledge (Levy and Ellis 2006).

The academic research community has implemented a peer-review, meaning that the work now published by others can be used with confidence that the quality and validity are accurate. It is important to look for cited and peer-reviewed articles that are published to maintain the quality of the review. We use a literature search in quality scholarly literature databases (Oria, ABI/INFORM, Google Scholar and ScienceDirect). By using a keyword search we use specific words or phrases in our searches to find the relevant literature. We are also able to perform a backward reference search, meaning that we also review the articles that the keyword findings have referred to, to find the relevant literature. Forward search is also useful where we are looking at who has been citing the different articles that we find, to see if they have done similar or relevant research that we can use as a basis or framework (Levy and Ellis 2006).

4.1 Uncertainty

In today's market, there is a vast increase in product variety and volatility of different markets where the ability to be flexible enough to tackle uncertainty is important for a company's competitive advantage (Sawhney 2006). Companies strive to improve the efficiency of their supply chain to eliminate, minimize or reduce the uncertainty, but in some given markets it's not possible to eliminate the uncertainty. However, it can be reduced, depending on the product or service involved (Christopher and Towill 2001). If a company are in a market where there is a high level of uncertainty of some sort, they must simply adapt and accept the uncertainty challenge and try to develop methods or strategies to meet the demand as much as possible (Mason-Jones, Naylor, and Towill 2000).

Uncertainty in supply chains takes many different forms, this can be regarding suppliers, competitors, quality, and customers. According to Angkiriwang, Pujawan, and Santosa (2014), we can distinguish between three types of uncertainty:

- Demand uncertainty – Is an uncertainty where the customers are ordering a mix of products and volume, changes in their orders, demand forecast errors and competitors' actions in the same market segment.

- Supply uncertainty – Is uncertainty about the lead time, material availability, material price, supplier capacity and alternative sourcing options.
- Internal uncertainty – is about information technology issues, available labour, available machine time, quality of a product or service and processing time.

One key source of uncertainty in supply chains is often related to the timings and specifications of the customer demand, often causing a “bullwhip” effect (also called the Forrester effect), becoming magnified by the “bullwhip” effect, and sometimes even being induced by the “bullwhip” effect (Disney and Towill 2003). The dynamic wave propagation in the supply chains is named “demand amplification” (Lee, Padmanabhan, and Whang 2004). Uncertainty induced by a system is due to the relationship and strategies inherent in a supply chain and therefore, it is under the direct control of the different companies involved (Towill and McCullen 1999).

Gerwin (1993) and (Lau 1996) argue that companies and supply chains could benefit from encouraging some degree of environmental uncertainty for obtaining a competitive advantage from their ability to be flexible. Gerwin (1993) states that flexibility is not only a flexible response to uncertainty in the environment, but it can also be a function of creating different uncertainties that the competitors cannot cope with. Although flexibility has value as a competitive differentiator when it comes to uncertainty, the supply chains and companies should also develop proactive strategies in order to reduce the instances of unwanted uncertainties (Schmenner and Tatikonda 2005).

One way of dealing with this uncertainty issue is by deploying the appropriate level of flexibility, which might be one of the reasons why flexibility has become one of the top priorities for service providers within competitive markets (Arias Aranda 2003). Bucki and Pesqueux (2000) state that both the structural and infrastructural decisions that will configure the operational strategy within services will have a direct influence on the level of flexibility of the given delivery system. When this is done right, and the flexibility levels support the implemented strategy in every dimension of the service delivered, it will have a direct impact on the operational performance (Spina et al. 1996). That said, it is difficult to analyse and measure this relationship since traditional cost performance measures lack some factors of relevance within the service sector. This is because it does not consider the customer-focus aspects such as satisfaction, quality and flexibility which

are crucial parts of a service providing company's success (Neely et al. 1997). Ghalayini and Noble (1996) state that performance measures used to evaluate the service operations strategies have to examine if non-cost-based measurements can cover the different aspects of service operation practices.

4.2 Flexibility

Flexibility in supply chains is a well discussed and investigated area in different sciences, where it is stated as a fuzzy concept in much of the literature. The concept is without a clear and accurate definition. For an organisation to become flexible as a unit, it is important that all parts of the organisation change to a more flexible nature (Chambers 1992). A variety of different definitions of flexibility have emerged and developed in recent years. The research into flexibility is as stated by Pfeiffer (2016) and Stevenson and Spring (2007) as being somewhat new. The first contributions within the field appeared in the late 1990s (Beamon 1999, Tsay and Lovejoy 1999, Vickery, Calantone, and Dröge 1999). More modern researchers emphasize that the importance of looking beyond the flexible factory and toward the flexible supply chain has increased (Fatemi 2010). Building flexibility into the supply chain is a typical response to reduce the impact of uncertainty. Angkiriwang, Pujawan, and Santosa (2014) define supply chain flexibility as “the ability of a system to respond to unexpected and unpredictable changes due to uncertain environment to meet a variety of customer needs or requirements, while still maintaining customer satisfaction and without adding significant cost”. This makes sense since there is no point in making a flexible supply chain if a firm or supply chain is losing revenue from being flexible. This underlines the need for an appropriate level of flexibility. There are two different strategies for increasing the supply chain flexibility, this can be either a reactive or a proactive strategy (Koste and Malhotra 1999).

The *reactive strategy* is when a company does nothing to guard itself against uncertainties. Moreover, it is reacting to a given event when it is happening to maintain the customer service level, and/or to maintain the efficiency of service. The reactive strategies include increasing the capacity buffer (stand-by capacity), increase in safety stocks (to reduce the shortage of inventory), adding safety lead time and providing backup suppliers (Angkiriwang, Pujawan, and Santosa 2014).

The *proactive strategy* revolves more around the redesigning of the processes, products and even the supply chain. Proactive strategies include sub-contracting or outsourcing (reduction in the risk of capacity utilization), risk pooling, component commonality, flexible procurement contracts, postponement, lead time reduction and setup time reduction (increase in the ability to mix flexibility and create volume) (Angkiriwang, Pujawan, and Santosa 2014).

Angkiriwang, Pujawan, and Santosa (2014) describe a situation where companies tend to use a reactive strategy more than a proactive strategy when dealing with uncertainty and flexibility. Therefore, focusing more on internal operations and tasks when reacting to change than on cooperating with external partners in their supply chains. Merschmann and Thonemann (2011) found that companies in Germany that operated in an environment with a high degree of uncertainty performed better when having a high level of flexibility. This means that being flexible can be expensive, however, in environments with a high degree of uncertainty, it can be profitable.

For companies to be flexible, it is important that they reach the different aims of flexibility that they have. Angkiriwang, Pujawan, and Santosa (2014) state three main objectives that companies will try to aim for:

- High service level: Service level is a measure of a company or organisation's ability to fulfil its customer demands. This is often in production measured as the number of backlogs, or customer satisfaction that is more quantifiable. In the service industry, service level can be measured by five facets of service quality, reliability, responsiveness, assurance, tangibles and empathy (Huang, Lee, and Chen 2019). Huang, Lee, and Chen (2019) also state that service quality and customer satisfaction can impact customer loyalty and brand awareness directly. It is firmly stated in the theory that the cost of getting a new customer is 25-85% higher than the cost of keeping an old customer, which is why these types of measurements and performances are extremely important.
- Resource utilization: Different activities involves many different competencies and bits of knowledge, meaning that these different resources need to be utilized at their best. With a higher degree of flexibility, it is possible to utilize these resources in a more efficient and better way.

- **Responsiveness:** This is a very important capability that businesses need in an uncertain environment where flexibility is needed. When responding to changes in demand, it is about being responsive, and reacting to the changes. Responsiveness can only be achieved where the level of flexibility is sufficient. Kumar et al. (2006) state that there is a need for operations to be more flexible in an environment where changes often appear unpredictable. If changes in different ways are unpredictable or predictable is difficult to say, however, the number of changes needed will often be unpredictable (Angkiriwang, Pujawan, and Santosa 2014).

As Kumar, Shankar, and Yadav (2008) state, flexibility is important to maintain customer service levels and therefore it is seen as important to perform on these three different objectives for a service company. Coping with the internal and external variations of different sorts becomes an important aspect to perform in the market and is one of the ways in which a company can be flexible (Gong 2008).

Service operation strategies

The service processes are determined by the operational strategy, and it is termed accordingly to how the strategic decisions are developed in an organization (Ho 1996). There are different definitions of strategies, but what gets repeated throughout the different definitions is that it enhances the company's market position by gaining a competitive advantage through positioning and resource building (Swink and Way 1995). The operational strategies within the service sector are referred to as the development of a service delivery scheme that will match the customer's expectations along with the customer's perception (Arias Aranda 2003). Arias Aranda (2002) identified three basic operational strategies within the service literature that are wanted in the service industry, which are service, process and customer-oriented operational strategies. Arias Aranda (2002) did also identify nine different structural and infrastructural choices that could lead the company to its determined operational strategy, which are:

- The degree of standardisation in the processes
- How many different services they can offer
- Relationship of the back and front office activities
- New service development and design
- The degree of customer participation

- The use of information technologies
- Orientation of PUSH/PULL at the delivery process
- Hyman resource specialization
- Type of operational layout

Flexibility in the strategic planning process

Flexibility is considered a multidimensional and complex concept that is difficult to satisfactorily define (Dreyer and Grønhaug 2004). There are many different definitions of flexibility, but in general, the definitions suggest that flexibility is a capability or an ability that an organization possesses to change, adapt or react to changes (Golden and Powell 2000). However, the strategic flexibility concept has gotten great attention within the organization and strategic management theory literature. The concept of strategic flexibility is advocated as the ability to respond to environmental changes externally (Johnson et al. 2003), where it also can be considered a strategic capability for different firms (Aaker and Mascarenhas 1984). Hitt, Keats, and Samuel (1998) view strategic flexibility as “the capability of the company to proact or respond quickly to changing competitive conditions and thereby develop and/or maintain a competitive advantage”. Strategic flexibility, in general, refers to the given company’s flexible capacity, to respond and adapt in an appropriate and timely manner to a considerable, uncertain environmental change that occurs rapidly. Which could have a meaningful impact on the performance of the organization (Roca-Puig et al. 2005, Aaker and Mascarenhas 1984, Golden and Powell 2000). Due to this, strategic flexibility can be looked at in two different ways. The first regards the diversity and variation of strategies, and the second one regards which degree the companies can switch from one given strategy over to another in a rapid manner (Slack 1983). Having flexibility within the strategic planning process has been considered a valuable strategic tool and one of the primary components of strategic flexibility for the companies facing uncertain and complex markets (Barringer and Bluedorn 1999). Moreover, the strategic planning process is treated as a logical and a continuous process which involves several different sequential steps in order to form the right strategy for the firm such as long-term objectives, generating and evaluating different strategies, analysis of the environment and defining the mission (Crittenden and Crittenden 2000).

Kukalis (1989) was the first to suggest the notion of planning flexibility to investigate how the characteristics of the environment and the firm affects the design phase of strategic

planning systems. Evans and Grewal et. al., (2001, 1991) defines strategic flexibility as “the extent to which new alternative decisions are generated and taken into account in the strategic planning process, allowing for positive organizational change and adaption to environmental turbulence”. Barringer and Bluedorn (1999) argues that the flexibility concept in the planning process means “the ability to adjust strategic plans to rapidly changing environment”. Other researchers state that planning flexibility is about preparing responsive, adaptive and changeable strategic plans, and the possibility to change them if necessary (Alpkan, Yilmaz, and Kaya 2007). Kukalis (1989) states that the antecedents of strategic planning flexibility regard frequent reviews, revisions, and short-term planning in order to adapt to changes in the environment. This underlines what Barringer and Bluedorn (1999) stated about planning flexibility being a primary component of strategic flexibility i.e., having the ability to adjust strategic objectives (Lau 1996), the ability to modify the strategic plans (Evans 1991), replication of once core technologies (Galbraith 1990), and the ability to reallocate the organisation's resources (Buckley and Casson 1998).

Moreover, if a company manages to have a flexible approach to its planning processes when operating in dynamic environments, it can allow them to adjust its strategic plans in a fast manner to control and monitor environmental fluctuations as well as to exploit market opportunities (Kukalis 1989, Dreyer and Grønhaug 2004, Grewal and Tansuhaj 2001). That should result in obtaining sustainable competitive advantages and improved customer value if it is done in the right manner (Matthyssens, Pauwels, and Vandenbempt 2005). Therefore, having a flexible approach in the planning processes is a major factor in adapting the strategic plans to changes in the competitive market (Dibrell, Down, and Bull 2007). Bhalla, Henderson, and Watkins (2006) state that if the management of a company does not take action to survive in the competitive market through adaptation, rigidity, and flexibility in order to gain a competitive advantage, it could lead to a disastrous outcome for the company. This might be the reason why so many companies are concentrating on gaining a competitive advantage through flexible ability. Flexibility based strategies are especially gaining importance in markets that are characterized by a high degree of uncertainties (Volberda 1996, Hitt, Keats, and Samuel 1998). Flexible planning processes combined with appropriate management systems internally could result in the best strategic practises for companies that are operating in dynamic markets (Venkatraman 1990, Brews and Hunt 1999, Alpkan, Yilmaz, and Kaya 2007).

Manufacturing flexibility

Manufacturing flexibility is the area where flexibility has gotten the most attention in the last decades for natural reasons. The manufacturing flexibility emphasizes more on tangible aspects like the production of actual products to meet the customer's needs, compared to the service flexibility which emphasizes both tangible but mostly intangible products in form of services. The dimensions of manufacturing flexibility are labour, machine, material handling, new product, modification, volume and capacity, lead time, labour, routing, responsiveness, operation, automation, production, expansion, changeover, operation, and market. Where three of these dimensions stand out as quite common in previous research, which are volume flexibility, new product flexibility and mixed flexibility (Mendes and Machado 2015). Even though manufacturing flexibility has different factors to take into consideration compared to flexibility within the service industry, they do share the same root cause of why they want to be flexible, which is globalization, uncertainty, and dynamic markets. The growing globalization trend calls for even harder competition for the companies within the manufacturing sector due to more competition from the international market, technological innovation, shorter product life cycle, mass customization and shorter lead times (Mendes and Machado 2015). This has turned the environment into a more uncertain and dynamic environment which results in continuous changes to the demand patterns which are characterized by sophisticated buyers and volatile markets. Duguay, Landry, and Pasin (1997) define manufacturing flexibility as "the capacity to deploy or redeploy production resources efficiently as changes in the environment require". Camison and Lopez (2010) examined the complex processes where a company would be in need of flexibility, together with the previous factors introducing flexibility to companies (Lau 1996). Although the examination of previous research and context would make economic benefits, scholars in operation management associates a higher level of flexibility with an inevitable increase in costs, which also means that there is no consensus on this topic (Menor, Kristal, and Rosenzweig 2007, Camison and Lopez 2010). However, the practitioners and academics do agree that performance depends on the availability of resources and the given company's ability to utilize the resources when operating in an uncertain and dynamic environment (Sanchez 1995).

Human resource flexibility

Human resource (HR) flexibility is a factor that plays a crucial role in response to the varying challenges of a growing business. Attia, Duquenne, and Lann (2014) state that HR flexibility acts as a reservoir for a given business. However, Wright, Dunford, and Snell (2001) describe HR flexibility as the firm's ability to adapt to changing environmental events. This implies how competent a firm is to be proactive and respond in time to the changes in the competitive business environments to gain or maintain a competitive advantage over time. This hypothesizes HR flexibility as a strategic type of flexibility that can help a firm to develop or preserve its competitive advantage. Ketkar and Sett (2009), (Ketkar and Sett 2010), as well as Wright and Snell (1998), explain flexible HR practices as to what extent the firm adapted to different situations and how fast the practices were able to resynthesize, reconfigure and redeploy. Ketkar and Sett (2009) also rate human resources as one of the most valuable when it comes to boosting a firm's performance and its opportunity to gain a competitive advantage in an uncertain and dynamic environment. Wright and Snell (1998) also declared that human resource management (HRM) practices can promote firm flexibility by developing a wide spectre of behavioural repertoires and employee skills. The firm's flexible HR practices lay the base for a specific climate and culture among the employees for development that can determine the firm's performance. This correlates well with Mendes and Machado (2015) highlighting human resources determinant and growing success factor for companies operating within competitive markets which underlines the importance of the employee's knowledge, skills and competencies in order to have a successful flexibility strategy.

There are some studies, like Wright, Dunford, and Snell (2001) from the strategic human resource management and Gerwin (2005) from the production and operations management literature that also address the importance of human resources in an organisation's improvement in responsiveness. Where Wright and Snell (1998) also categorize HR flexibility through three components which are:

- *Employee skill flexibility* refers to how different people with varied capabilities can be used to perform different activities since their skill set allows them to perform a variety of tasks. (Wright and Snell 1998). This means that a firm has a high level of flexibility when its employees have a broad scope of skills, enabling them to perform many different tasks.

- *Employee behavioural flexibility* refers to how many various behavioural scripts employees have that can be adjusted to match the needs of different scenarios. Employees that can apply these behavioural scripts appropriately in a range of settings, rather than following standard operating procedures, allow the organization to react and respond to changing situations, boosting its competitiveness. (Wright and Snell 1998).
- *HR flexibility practices* are defined by Bhattacharya, Gibson, and Doty (2005) as “the extent to which the firm’s HR practices can be adapted and applied across a variety of situations, or across various sites or units of the firm, at the speed with which this adaption and application can be made”. Bhattacharya, Gibson, and Doty (2005) further state that organizations with this level of flexibility generate a skill that is difficult to mimic and non-substitutable, as well as benefits such as boosting responsiveness to external changes and achieving strategic consistency throughout numerous units.

Barney (1991) argued that if a firm's resources or skills have the following characteristics: rarity, inimitability, value and non-substitutability, they could provide a durable competitive advantage. HR flexibility has long been thought of as an organizational capability derived from human skills and behaviours being applied through Human Resource practices (Bhattacharya, Gibson, and Doty 2005). This meets all of Barney's (1991) criteria, and can therefore be a source of long-term competitive advantage for businesses. As a result, HR flexibility should be a driving force behind the high business performance. Bhattacharya, Gibson, and Doty (2005) state that the three sub-dimensions of HR flexibility were found to be favourably correlated with financial performance. HR flexibility should therefore help with more aspects of a company's success. Thus, HR flexibility must be supported by organisational architecture and culture in order to have an impact on performance.

On the other hand, Mendes and Machado (2015) addressed the relationship between the employee's skills, flexibility, and performance, and stated that “the extent to which skilled employees might be a determinant of a firm's performance is less known”. That might be due to the fragmented literature which is often based on case study results, individual opinions, and partial findings from biased research fields. Although, without stating

anything, it would be fair to assume that a higher level of employee skill would contribute in a positive manner to both flexibility and performance of a firm.

Process flexibility

A company could more easily cope with different changes such as increasing demand uncertainty and variety if they have flexible processes (Goyal and Netessine 2011). At the same time, more process flexibility does not always have to be better since flexibility can be a costly affair (He, Xu, and Hua 2012). Moreover, the flexibility level must be at an appropriate level depending on the characteristics of the given business environment, the different processes involved and the economic outcome that accompanies one another when investigating the flexibility dimensions (Afflerbach et al. 2014).

The importance of process flexibility has led many researchers into investigating how to measure and determine the optimal level of process flexibility, where most approaches have been in the capacity-flexibility and operation/production literature (Afflerbach et al. 2014).

Operational strategy within the service sector is quite different from the manufacturing sector where the strategic operations of the organization are more characterized by the level of importance between flexibility, speed, cost efficiency and dependability. Another difference is the demand rate which is somewhat predictable in the manufacturing sector compared to the service industry where they must meet an unpredictable demand (Jack and Powers 2004).

Afflerbach et al. (2014) define process flexibility as “the ability to create multiple outputs on the same capacity and to reallocate capacity between processes in response to realized demand”. This definition states that process flexibility can enhance a company’s ability to have volume flexibility which is achieved when the given processes involved are functionally flexible with the use of a flexibility design strategy. Goyal and Netessine (2011) state that volume flexibility enables a company’s ability to both increase and decrease the production rate both below and above the firm’s current maximum capacity. Therefore, a company can utilize the functional flexibility to produce and deliver a variety of desired outputs (Afflerbach et al. 2014). To implement the functional flexibility from a flexibility design strategy, one must have different execution path alternatives for a given process within the model design, for then to choose the most fitting path for running the

process (Schonenberg et al. 2008). The flexibility design strategy can be obtained through different factors like information systems monitoring the processes, multi-skilling, multi-purpose machines and cross-training (Reichert and Weber 2012, Irvani, Van Oyen, and Sims 2005).

The need for process flexibility is driven by different characteristics according to (Gebauer and Schober 2006), which are variability, time criticality and uncertainty. Where variability is a measurement of how frequent the given processes are executed, time criticality is the fraction of tasks that are time-critical. Uncertainty takes two forms, which is structural uncertainty which is for example risks from within the production processes, and environmental uncertainty which can be demand risks. He, Xu, and Hua (2012) also state uncertainty as the main driver of the need for process flexibility. Pujawan (2004) states that there are both external and internal drivers of process flexibility which are can be process similarity and variety in products. Reichert and Weber (2012) introduce characteristics that are supported by information system software, also called process-aware, that implies the need for process flexibility due to looseness and variability within the uncertainty. At last, Afflerbach et al. (2014) propose that criticality, variability, similarity and uncertainty as the four most popular drivers of flexibility in processes.

There is also a well-discussed issue between the relationship between standardization and process flexibility, where the relationship between the two can be understood as coinciding or complementary depending on the setting (Afflerbach et al. 2014). Standardization and process flexibility can be seen as coinciding because standardization may have the ability to reduce the number of process variants by inhibiting the executing personnel from deviating from the different variants, whereas a certain degree of freedom can help the firm to cope with a higher output variety (Pentland 2003). Standardization and process flexibility can also be looked at as complimentary if the processes are outlined in a way that makes it easier to put together suitable processes and changes to the processes while the processes are running (Münstermann, Eckhardt, and Weitzel 2010, Schonenberg et al. 2008).

Service flexibility

The service sector often sells intangible products to its customers which a person or a company are better at doing than the customers buying the service. This can be everything

from buying a service from a hairdresser, having a check-up by a doctor, or hiring a highly skilled engineer that is specialized in a specific area. Therefore, outsourcing has become so popular in the competitive market where the service provider creates value for their customers. The competitive market raises the pressure and expectation on the service provider to accomplish the tasks in less time, especially without having to wait in line because a customer waiting in line is a potentially lost customer.

Since service production is characterized by a high level of uncertainty (Corsten and Gössinger 2006), and a large part of this uncertainty is caused by the need to integrate different external factors from the customer into the production process. The customer will hire a service company to change something from its current state and over to the desired state without any so-called “unaccepted discrepancy” (deviation) from the request. In our case, it could be for example a crane breaking down on an offshore platform, where the crane’s current state is broken, and the desired state is a fixed (functional) crane. The unaccepted discrepancy is referred to as the “customer’s problem”. After a problem arises for the customer, they will start the problem-solving process, where they in some cases won’t have the capacity nor the skill to solve the problem on their own, so they will have to utilize the problem-solving capacity and skill provided by a third-party service provider. When the customer contacts the third-party service provider in order to solve the problem, they will thereby create a so-called external production factor. If the service provider says yes to this service order request, both the service provider and the customer will have to work in a cooperative way to find a solution to the given problem (Corsten and Gössinger 2006). Then the service provider will either transform the given state of the external production factor by repairing the crane, or they can inform the customer regarding the target state that the crane cannot be repaired. The service provider has provided benefits to the customer if the crane gets repaired, or if they discover that the crane cannot get fixed (Corsten and Gössinger 2006).

The consumption and production will partially happen at the same time if the external production factor gets integrated into the production process, which means that the uncertainty factor is placed into the production process of the service provider. Causes of uncertainty can typically be differing requirements from the customer and the customer's influence on the production process and fluctuations in demand (Corsten and Gössinger 2006).

Flexibility in service is involving the introduction of new designs and services quickly into the system that delivers the service and also adjusts capacity to handle changes in customer demands quickly (Suarez, Cusumano, and Fine 1996). Service flexibility's main goal is therefore to improve the timing and quantity of resource allocations and not deploy human or material resources when they are not needed (Duclos, Sih, and Lummus 1995). According to Arias Aranda (2003), customer interaction and customization imply a high degree of flexibility for the service. The main input in a service industry can be information flow and not material flow, therefore is customer interaction an important part of the performance (Adler 1988). Customers are becoming more and more interested in having integral services provided by the same firm (Arias Aranda 2003). Human resource flexibility and versatility are also important aspects that need to be considered as they are a more integrated part of the service delivery than previously compared to machines (Harvey, Lefebvre, and Lefebvre 1997).

Summary of flexibility

When looking at the different definitions of manufacturing, service, and human resource flexibility, we clearly see that they state pretty much the same, but with slight deviations. By taking parts of these definitions, we can find a suitable definition to fit the purpose of this assignment. For this assignment, we can define flexibility as the ability of a company to adapt to changes in the demand, changes that occur during the execution of the service and changes in surroundings which have an impact on execution of the service.

Looking at previous research into flexibility, we clearly see that flexibility is a much-needed ability for firms to operate in competitive, uncertain, and dynamic markets. However, being flexible isn't enough, the flexibility needs to be at the appropriate levels to perform well in the market. This is often the most difficult aspect for many firms, especially for the service industry utilizing human resources.

4.3 Performance measures in the service industry

Performance measures for service companies are to a large extent different from those in the manufacturing industry. Service operations manager needs the same degree to receive relevant and specific feedback in order to make effective and good decisions in a market with high volatility and many changes (Chenhall 1997). According to Arias Aranda

(2003), many empirical studies have shown the great influence that flexibility has on performance measures, in particular, the non-financial ones. Non-financial measures are contributors to enhancing performance within the changing environment where flexibility is needed and therefore using these measures to maximize this performance. The dimensions of operations strategy are therefore important to embed in the performance measurement system (Sampson 1996). Different arguments for using non-financial measures are not to deny the importance of financial performance measures, but more to demonstrate its limitations of it and add different measures to it (Arias Aranda 2003).

4.4 Competitive advantage

Competitive advantage is defined by Grahovac and Miller (2009) as something a firm offers that make them achieve a competitive advantage, helping them to occupy a privileged position in their client's mind. When having a competitive advantage, a company are becoming a creator of superior value for their clients. The competitive advantage can be said to be an indicator of different customers' likelihood of buying different offerings from a firm, therefore, contributing to the improvement of the given firm's performance in the market (Kaleka and Morgan 2017).

There are different values the seller can create to enhance the perceived value for customers. Market performances are often corresponding with the seller's captured value and the customer's acceptable realized exchange value (Kaleka and Morgan 2017). There are different focuses for different markets, cost leadership and leaders of quality are often two of the border values that both customers and sellers try to improve. Price advantage, product advantage and service advantage are the three different advantages mentioned by Kaleka and Morgan (2017).

5.0 Case description

The problem of the case company is that project managers (onshore personnel) often is in contact with representatives from clients that don't have the information required to request a quotation from the case company. This often results in incomplete requests, which again leads to change when both the case company and its clients get an overview of the actual situation. The case company has solved this by sending out highly skilled workers and being flexible in the work tasks that are requested to be performed. When

sending out overqualified personnel, they get the opportunity to solve more tasks that can occur, without having to mobilize more personnel. By following this strategy, the case company can take on more work scope as it occurs and therefore be service-minded towards the customers and increase their own revenues by performing more work at different locations.

Firms usually face a stochastic demand, but in our case, it is not the demand itself that is the problem, it is changes in the project contract after the contract has been set. This makes a highly uncertain external environment where an appropriate level of flexibility is needed. The case company sales personnel and project engineers are mostly in contact with clients who work onshore when administering projects with different scopes prior to mobilization. This leads to an issue regarding planning because they often receive requests to do additional tasks after the initial contract has been set, so the planning process is difficult. The case company will always say yes to these changes without really knowing the direct economic outcome, but they feel the need to be this flexible in order to gain customer loyalty and satisfaction to win more contracts. They are not quite sure if this highly flexible strategy is profitable, or if they could lower their flexibility level in certain areas. We will investigate the economic performance of this highly flexible strategy in this research paper.

6.0 Data and methods

Research methodology is a discussion of reasoning for why the given methods are being used. Often referring to the method as the technical steps undergone to do the actual research (Schneider 2014). We will use this chapter to describe what research methodology will be used in the research of this article.

6.1 Research Approaches

The method needed to answer our research questions will be a quantitative approach. Quantitative research is a numerical representation and manipulation of observation with the sole purpose of explaining and describing what the observations are reflecting (Sukamolson 2007, 2).

6.1.1 Quantitative research

The quantitative type of research involves measurement and assumes that the studied phenomena are possible to measure to some degree. Quantitative research aims to analyse data for different trends and relationships and/or to verify the measurements that have been made (Watson 2015). People often think about using mathematically based methods when analysing data in quantitative research. However, the way of collecting the data is more important than how you analyse it. Often, the main task is to gather relevant and good data that later can be analysed, providing a result of some sort. We use quantitative methods when we want a quantitative answer, see numerical change, segment audience, quantify options or behaviours, explain certain phenomena or test hypotheses (Sukamolson 2007).

Descriptive statistics and correlation matrix

To provide an overview of the data gathered we will use some descriptive statistics, such as the mean, median, standard deviation, minimum value, and maximum value. The numerical procedures or graphical tools used to organize and characterize traits or factors from a specific sample are known as descriptive statistics. (Fisher and Marshall 2009). In this thesis, it will only be used numerical procedure to describe the data. A correlation matrix is used to describe the patterns of relations among different variables in a matrix. This type of matrix is used when the number of variables is large, moreover, it provides a good overview of the relations between the different variables (Friendly 2002). To see whether different variables are significantly correlated, we will use the rule of thumb to see if a linear relationship exists. The rule of thumb is as stated by Krehbiel (2004) $|r_{xy}| > \frac{2}{\sqrt{n}}$.

6.1.2 Multiple Regression analysis

Regression analysis is a statistical tool that allows us to characterize the relationship between two or more variables. This representation could be basic, with only two variables in a single equation, or it could be highly complex, with numerous variables and possibly hundreds of equations. Regression analysis is useful in discovering how one variable is affected by one or several different variables, from the simplest to the most complex interactions (Wilson, Keating, and Beal 2015, 11). In this paper we will use multiple regression analysis because this can accommodate many explanatory variables that may be correlated, looking at many factors that can simultaneously affect the dependent variable (Wooldridge 2020, 66).

Here are some examples of what a multiple regression model can be used to analyse:

- Using varying amounts of nutritional supplementation, exercise, and behaviour change to estimate weight increase in children.
- projecting college freshmen's academic achievement (GPA) based on aptitude test scores, high school grades, and IQ level.
- Estimating sales changes due to increased advertising spending, additional sales employees, increased management personnel, and various sales tactics.
- Daily fuel consumption prediction for house heating based on daily temperature, humidity, wind velocity, and the previous day's temperature
- Calculating interest rate fluctuations in relation to the amount of deficit spending, inflation rate, the value of the CPI, value of the GNP, and the value of the CPI.

(Freund, Wilson, and Sa 2006)

Regression diagnostics is where one investigates whether the calculated model and the assumptions made are consistent with the recorded data (Ferré 2009). The diagnostics can include both numerical and graphic tools and aim to investigate if outliers may dominate the regression, possibly distorting the results. Diagnoses are also being done to see if strong relationships (correlation) among the independent variables have an impact on results (Ferré 2009). For the regression analyses, we performed a Breusch-Pagan-test, which indicated heteroskedasticity. To keep the OLS valid with heteroskedasticity, we have performed Newey-West standard errors for the t-tests. This procedure has in the last two decades been used to correct for standard errors and t-statistics, being valid in large sample sizes (Wooldridge 2020, 263). In this paper, Newey-West standard errors are used to adjust the heteroskedasticity.

With help of the Shapiro-Wilk test, it was also indicated *non-normal error-term*, this can for small samples mean that t- and P-values become misleading. However, OLS asymptotics state that with a large sample size ($n=90$) we can use the calculated values even though there is a violation of the assumption of normal error-term (Wooldridge 2020, 164).

6.2 Research Design

Frankfort-Nachmias and Nachmias (2008, 89) define research design as “a plan to help the researcher in the process of collecting, analysing, and interpreting observations to come up with solutions to the given research problem”.

Yin (2014) describes the research design as the sequence that ties the empirical data to a given study’s initial research question, thereafter to the conclusion of it.

Bryman and Bell (2015, 53) discuss five of the most frequently used research design methods used in social research which are: case study design, cross-sectional design, longitudinal design, experimental design, and comparative design.

Piekkari, Plakoyiannaki, and Welch (2009) state that researchers must be more conscious about which type of research design approach they are going to use, and they should justify their given choice explicitly. Therefore, we chose to evaluate two of the approaches which is cross-sectional design and single-case study, to determine which will be best suited for our thesis problem statement.

6.2.1 Single case study

A single-case study is an intensive and detailed analysis of one single case. This could either be one event, a single organisation, a single location or a single person (Bryman and Bell 2015). A holistic case study is when it only examines the global nature of a given organisation or program. While an embedded case study if the same study involves more than one unit, and more units are given attention. It’s important to keep focus on the main unit of data.

6.2.2 Cross-sectional design

A cross-sectional research design needs to collect data from more than one unit, from one single point in time for the sake of collecting quantitative and quantifiable data that are relation to several variables which will be analysed in order to detect a pattern of association (Bryman and Bell 2015).

6.2.3 The research design for this paper

In this research, we will be using a combination of a single-case study and a cross-sectional design for our research design. We will be using the single-case study because

we are examining one single organisation. But we will also collect quantitative data from 90 projects (cases) from three of the case company's largest customers for our analysis. The quantitative historical data will be extracted once from the case company's database, so we can consider the data to be extracted at a single point in time, where we won't need to go back to extract more data. The quantitative data extracted will be used to look for variations between the projects and look for any association or pattern between seven variables, which is why we choose to combine the single-case study with a cross-sectional design.

6.3 Collection of quantitative data

When the research problem and research question have been defined, the next step is to collect the relevant data to answer the research questions. The data are collected through the company's ERP systems. Data are collected from 90 different projects with three different customers and within four different work types. The projects are dated from 2020 to 2022.

6.3.1 Primary data

Primary data can be defined as “data collected for the specific research problem at hand, using the fitting procedure that is best suited for the research question” (Hox and Boeije 2005). The new data are added to the existing store of social knowledge when primary data are collected. There are several different ways of collecting primary data, the most important ones are observations, interviews, questionnaires, consumer panels and schedules (Hox and Boeije 2005).

Our goals were to look at different flexibility variables in both project planning and execution, and how it affects economic performance, which is why we realized early that we needed quantitative data from within the projects. This primary data could be gathered from the case company's own information systems. We were hoping to find data that showed when and where changes occurred, however, this is not tracked sufficiently in their systems. Therefore, the data gathered are data that can be compared with one another through what was originally planned and what became the actual outcome.

The accessible data in various projects for the case company can be used to measure different aspects of flexibility. A template project for our firm is that they start by

receiving a request, either according to a yearly plan from the customer or unplanned work (AD HOC) they need to perform. After this, the case company creates a quotation to perform the requested work. There are different postings in the quote, according to what is necessary for the scope at hand. The first post in their quote states the needed onshore hours (reporting, planning, coordination, quality assurance and travel), and the second post says something about the need for time to perform the scope offshore or at the site (number of workers and number of hours), thirdly they have services (products), such as certificates, fourthly, the mobilization costs to and from the operating site come and lastly, they have equipment rent. This is a cost that our company charge customers according to days in transit and in use.

Personnel and equipment need to be moved to the location of use, and this comes with a cost. There is a lot of work going into the coordination of both personnel and equipment to make sure that everything is according to what is needed in different locations and that it arrives on time. These types of costs are inevitable in some way, moreover, it's important to improve efficiency and try to minimize the costs as much as possible. Having personnel living close to helicopter platforms or airports can be a way of increasing efficiency and saving money, it is therefore important to think tactically and coordinate efficiently on this aspect.

The data gathered for our research we collected from our company's ERP system. In this system, we can see different economic and time-usage data and how the different projects have performed.

We can see what they intend to do with the project, while we can see in their invoice, timesheets and costs what has been performed in the project and compare it to the quote they've already created. The variables we have found and implemented in our spreadsheet are variables that show differences in what was planned for project execution and what was performed in the project. These are the seven different variables:

Personnel flexibility

The personnel variable shows the difference in the amount of personnel used in the operations, meaning that they had planned for a team of three persons offshore, the difference in used and planned will then be the difference in per cent. With operations we

mean the personnel being at the site performing the work, being the needed qualified personnel., the team always need to be three people if there is climbing as a part of the scope, while certification of a crane may only require one person to perform the scope.

Mobilizations flexibility

The mobilization variable shows the difference in the number of mobilizations needed to perform the project according to what they planned. Most of the time it is enough with one planned mobilization. However, this number can also vary sometimes as changes occur. The cost of mobilizing personnel to a location is high, so the less time used for this, the better.

Onshore flexibility

The *onshore flexibility* variable shows changes in onshore hours, these hours are used for planning, coordinating, and reporting, and these hours often need to change if the scope and workload in projects change drastically. The hours used onshore are coming from personnel that are either project engineers, coordinating personnel or executing personnel that finish of reporting and documentation onshore after demobilizing. This is often done when they have a flight close to the deadline of their work at the given location, meaning that they don't have the time to finish documentation and need to complete it when arriving onshore.

Offshore flexibility

The *offshore variable* measures the changes in offshore hours in difference to what was planned, where the planned hours are often an estimate. However, with the amount of experience the case company holds, they often know exactly what they need to do for the different jobs. Changes occur when the scope of work is larger than what was intended or there is an issue in regard to access to where they need to perform the different controls. There are many different factors that can play in when the number of offshore hours is exceeded, often there is more than one factor that comes into play. It is therefore important to maintain and always work with the communication with the customers, so they know why and how much the hours have changed because the customers need to sign and approve the timesheet before the executing personnel leaves the worksite.

Equipment flexibility

The equipment *rent flexibility* variable shows the difference in equipment rent from what was planned. This is as said by employees at the case company to be one of the posts where it varies most of the time. The equipment needs to be returned by the customer when a job is completed, customers may use a long time before they get the opportunity to return equipment from a project when they have a lot to do, so it can take many days before the rent will be added to the invoice. This is a variable where the equipment rentals can be a lot more expensive than what is planned only due to bad coordination and the low willingness of doing a simple task such as returning equipment from an offshore platform. This can arguably be because the offshore site managers have many tasks at hand, and the less important ones tend to be overlooked and moved backwards in line. This can be seen as an opportunity for companies that can earn good money from operating companies, which has bigger costs and issues that need to be handled before acting on smaller things such as equipment that needs to be returned.

Turnover flexibility

The *turnover flexibility* variable is a variable that shows the difference in turnover between what was planned and what the invoiced amount turned out to be. This variable is only a variable that shows the difference in the total project size, this is a good indicator to show what amount of change has happened throughout the project's lifetime. One can with this variable see the exact change in what was planned, and what it turned out to be in the matter of the project scope.

Profit Margin

The *profit margin* variable is measuring the financial performance of a project. This variable says something about how much of the turnover is remaining when the project is finished, and all costs are counted. It is a measure of numbers and shows us how the income of the project is performing against the costs in a project.

7.0 Research Summary

It is clear from previous research that flexibility is a much-desired capability for companies that operate in highly uncertain and dynamic market environments in order to gain a competitive advantage. It also shows that companies tend to perform better by being flexible in such environments, especially when it comes to non-financial performance.

We discovered from our literature review that there is no research on the service providing companies in the oil and gas sector and that there is a gap in the empirical evidence concerning flexibility's impact on the financial performance. This research paper will therefore investigate how a highly flexible strategy has on the financial performance for a case company. This research paper has contributed to the existing literature by collecting empirical data on flexibility variables from a successful service provider in the Norwegian oil and gas industry.

We have been using a combination of fact-finding and theory building to investigate the problem, where the research design has been a combination of a single-case study and a cross-sectional design, with a linear research process. A quantitative research methodology has been used to analyse the empirical data gathered from the case company's ERP system. The empirical data was gathered from 90 projects, from four different workgroups from three of the case company's largest customers. There are two different data collected, one from the quoted amount of work (intended work), and the actual work performed. The difference on what was quoted, and what was performed can be seen as an expression of flexibility. The research design used is a combination of a single case study with a cross-sectional design and a linear research process. We will be using a quantitative research strategy with an empirical data gathering methodology.

In this investigation, M1 shows that *offshore flexibility*, *onshore flexibility* and *mobilizations flexibility* are significantly impacting *turnover flexibility*. Moreover, M2 shows that *Offshore flexibility* is negatively impacting *profit margin* while *turnover flexibility* is slightly significantly impacting *profit margin*. By looking at the correlation between the significant variables, indicating that if one is changing, the other one is also changing. Indicating that *offshore flexibility* and *turnover flexibility* is increasing together. Our results, therefore, indicate that flexibility will have a positive impact on financial performance through an increase in turnover.

7.1 Limitations of the study

Several limitations when it comes to the methodology of our study need to be noted. Firstly, the research design was cross-sectional, meaning that causalities can be more difficult to determine. Even though we argue that flexibility can increase revenues and

adaptability, a culture that strives for flexibility will most likely influence employees' behaviour within a company. Secondly, the data are collected from a single source, meaning that common method bias could be an issue for the study. Thirdly we haven't in this paper measured the levels of flexibility that the case company is having within their projects. With this level it might be that we could have found a cut-off point for flexibility levels, seeing when flexibility is profitable and not. A flexible strategy's performance is highly dependent on whether the level of flexibility is accurate or not. Finally, the different flexibility variables are given in different units, opening the opportunity that variables with the same unit might provide more accurate and clearer indications.

7.2 Future Research

There is no discussion that there are several opportunities for extending this work. Firstly, we only included one company within the industry in this study. There should be a possibility to extend this study to include more companies and different niche companies within different segments of the service industry. Moreover, there should be a possibility of extending the dataset, including several more projects within more workgroups and adding more customers to see more of the impact these can have. More accurate measurements from companies can also help to improve the overall understanding of the dimensions of flexibility for such a company and why they feel the need for being flexible. Moreover, the levels of flexibility in different projects haven't been measured in this paper. With this measure it can be that one can better explain the economic impact of a flexible strategy in projects. Seeing whether the levels of flexibility used are the most profitable ones.

8.0 References

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9.0 Part 2: The research paper

The Economic Impact of a Flexible Strategy: A Case Study of a Service Provider to the Oil and Gas industry

The Economic Impact of a Flexible Strategy: A Case Study of a Service Provider to the Oil and Gas industry

Abstract

Purpose: This paper aims to investigate the impact a flexible strategy has on the economic performance of a service-providing company in the oil and gas industry. Six variables of flexibility have been considered in the investigation. These variables are *turnover flexibility*, *offshore flexibility*, *personnel flexibility*, *mobilization flexibility*, *onshore flexibility*, *rent flexibility*, and *profit margins*.

Design/methodology/approach: The data have been collected from the case company's ERP systems and contain 90 different projects with three different customers and four workgroups. We have used a cross-sectional design regression model.

Findings: Results from this study indicate that a flexible strategy has a positive impact on economic performance through increasing turnover. There is also an indication that the *profit margins* are staying the same when increasing turnover.

Originality/value: This study is one of the first empirical studies concerning the economic impact of a flexible strategy for a service provider to the oil and gas industry. The authors contributed by filling a gap in the literature by collecting empirical evidence on different flexibility variables impacting the economic performance of a flexible strategy.

Keywords: Flexibility, service industry, oil and gas, economic performance, uncertainty.

10.0 Introduction

Flexibility is important for companies to stay competitive when providing services to the oil and gas industry. Service companies in the oil and gas industry need to have a high degree of flexibility to deal with the high probability of customers suddenly increasing, reducing, cancelling, or moving backwards or forwards on their orders. Increasing uncertainty and higher satisfactory demands have made the competition more challenging for the service providers. Efficiency in the service for such companies is important to maintain competitive prices and staying flexible to deal with time-varying and dynamic demand is more important now than ever.

Turnover each day in the oil and gas industry is of significant size, and services tend to be prioritized and paid for immediately to avoid downtime. Service providers in this market often subsist on extra scopes of work being presented when already being mobilized. The opportunity for extra work scope that occurs is important to exploit, being able to increase revenues and turnover. It is well-known that operating companies in the oil and gas industry have a large power over their suppliers. Service providers to this industry are therefore dependent on being flexible, taking advantage of the opportunities that occur when they occur, enabling competitiveness in such an uncertain environment. With opportunities, it is meant the extra work scope that clients are requesting when already being mobilized offshore. This can be for the same type of work or completely different services.

Angkiriwang, Pujawan, and Santosa (2014) state that flexibility together with delivery speed, quality and cost are important drivers for competitiveness in different markets, and should therefore be seen in a collaborative way from a supply chain perspective (Fantazy, Kumar, and Kumar 2009, Pujawan 2004). Vickery, Calantone, and Dröge (1999) point out that supply chain flexibility has a positive impact on the bottom line of different companies, showing that flexibility for service providers is seen as a positive feature for service providers.

Even though a high degree of flexibility can give a competitive advantage, it's also costly (Pujawan 2004, Gupta and Goyal 1989, Koste and Malhotra 1999, Merschmann and Thonemann 2011). Flexibility levels for each company will not be equal (Stevenson and

Spring 2007, Sánchez and Pérez 2005). Moreover, different companies should carefully consider the level of flexibility needed for them (Pujawan 2004), because a higher degree of flexibility does not always result in higher turnover and revenues (Bernardo and Mohamed 1992, Gong 2008). The level of flexibility will come to a certain point before diminishing returns, where a company is starting to lose money for being too flexible. It is about finding the right balance between flexibility levels and the correct strategy for implementing the appropriate level.

It is stated by Arias-Aranda (2003) that to deal with uncertainty, the right levels of flexibility will be needed. The literature previously stated that it can be difficult to analyse and measure the relationship between flexibility levels and operational performance. Traditional cost performance measures lack the factors of relevance within the service sector, where it does not consider the customer-focus aspect such as satisfaction and quality which are crucial parts of a service providing company's success (Neely et al. 1997).

Flexibility has been investigated to a high degree in both the manufacturing and operations industry (Afflerbach et al. 2014). Moreover, this paper is extending the current research in two different ways. Firstly, past research has focused mainly on the influence flexibility has on non-financial performance, while our goal is to also look at the economic performance. By doing this, we provide a bigger picture of the outcome of flexibility. Secondly, the previous research has looked at flexibility within several other markets, while this research is to our knowledge the only one looking at flexibility for service providers in the oil and gas industry.

In this paper, we are addressing the gaps in the literature by answering the following research question: **How does a flexible strategy impact the economic performance of a service provider to the oil and gas industry?**

11.0 Literature review

Flexibility as a subject has been present in the literature and research for more than two decades (Angkiriwang, Pujawan, and Santosa 2014). One can say that the topic is highly

related to several different theories and concepts, such as uncertainty, resilience, and agility. Flexibility in an organization is associated with the capacity of the organization to adapt to uncertainties it faces (Golden and Powell 2000). The flexibility term is relatively old in scientific literature and is widely used in many different subject areas. According to Ademi, Klungseth, and Olsson (2021), the research on flexibility has increased in newer times due to the necessity of organisations to respond to unforeseen changes in a business environment and the increase of uncertainty in this environment (Dreyer and Grønhaug 2004, Golden and Powell 2000, Jan Eppink 1978, Volberda 1996). The meaning of the term is vague and depends to a large extent on what context it is being used (Ademi, Klungseth, and Olsson 2021). Most definitions are relating flexibility to the ability to adapt (Volberda 1996). Bahrami (1992, 48) defines flexibility as a “multi-dimensional concept – demanding agility and versatility; associated with change innovation, and novelty; coupled with robustness and resilience, implying stability, sustainable advantage, and capabilities that may evolve over time”. Ademi, Klungseth, and Olsson (2021) also state that flexibility is closely related to other different concepts such as adaptivity, resilience, robustness, liquidity, agility, versatility, elasticity, hedging and corrigibility. Strategic flexibility is a firm ability and strategy to handle change (Brozovic 2018). It allows for the creation and performance of different strategic options that respond to or lead a change.

Flexibility is often seen as a reactive capability and has a strategic role for most companies. Some research states that businesses and supply chains can encourage or provoke uncertainty in their industry to gain a competitive advantage from the capabilities that they have. Gerwin (1993) states that flexibility is not only a response to the uncertain market environment but also explains that it has a function of creating uncertainties that competitors cannot handle. Nevertheless, companies should also develop different proactive strategies to handle with sources of unwanted uncertainties (Schmenner and Tatikonda 2005).

In manufacturing, flexibility is widely accepted as the ability of a system to cope with change (Mandelbaum and Buzacott 1990). While Zelenovic (1982) defined flexibility as the ability of a system to adapt itself to various changes. Changes in a manufacturing system are different to the service industry, having some similarities. In manufacturing systems, changes can be in product mix, process, raw material, or product volume. While

in the service industry it can be a sudden increase, reduction, cancelling or moving of orders.

Flexibility in an organisation is an important factor to cope with business uncertainties and has therefore become important to every aspect (Liao and Marsillac 2015). It is important for companies to compete in their respective markets due to the increasing and intensifying competition and globalisation in different industries (Urtasun-Alonso et al. 2014). Several authors see flexibility in organisations as one of the most important factors for companies to gain a competitive advantage in today's markets (Kathuria and Partovi 1999, Golden and Powell 2000, Urtasun-Alonso et al. 2014). Findings from different studies indicate that flexibility factors like human resource (HR) flexibility are positively impacting a firm's performance (Ketkar and Sett 2009, 2010). Earlier research grew interested in quantifying the relationship between HR flexibility and different firms' performance, leading to some studies linking the impact of HR flexibility and flexibility-inducing HR practices to company performance (Sekhar, Patwardhan, and Vyas 2017). Wright and Snell (1998) state that employee flexibility is to what extent an employee can possess skills and behavioural repertoires that provide the firm with the option of being flexible. The employees can possess two main skills to improve flexibility, one being skill flexibility and the other being behavioural flexibility. Skill flexibility is the opportunity for an employee to alternatively apply the skills and behavioural flexibility is a higher tolerance for non-routine behaviours (Wright and Snell 1998). Employees can then adapt their responses to varying circumstances and behave appropriately during these different situations, helping the entire organisation to deal with a variety of situations (Bhattacharya, Gibson, and Doty 2005). Bhattacharya, Gibson, and Doty (2005) also revealed that flexibility in employees is valuable because it generates output streams for existing requirements and is also capable to produce output for possible alternative requirements that clients might have.

Flexibility can be classified into two categories which are internal and external flexibility. Internal flexibility refers to a firm's ability to respond to changing conditions by modifying the organization internally. External flexibility refers to changes in the external market, such as the labour market (Martínez-Sánchez et al. 2011).

Kogut and Kulatilaka (2001) suggest that flexibility within HR can be a better option for an organisation to adapt to both external and internal changes. Helping the company to respond to alteration and thereby gaining a competitive advantage over its rivals that do not possess this ability. An Indian IT study stated that training, job design, compensation and incentives have an impact on the operational performance, increasing product quality, employee productivity, speed of delivery, employee retention and operating costs (Paul and Anantharaman 2003).

Uncertainty in demand for service companies in the oil and gas industry is a major factor as to why they need flexibility. There are different types of uncertainty. Demand uncertainty is referring to the probabilistic nature of demand types, quantity, timing, and locations (Angkiriwang, Pujawan, and Santosa 2014). There are different ways in which demand uncertainty can occur, it can come from errors in the demand forecast (Schmitt 1984), changes in customer orders (Pujawan and Smart 2012, Van Kampen, Van Donk, and Van Der Zee 2010, Wong, Boon-Itt, and Wong 2011) and uncertainty about what the customer needs really are, and what they will order (Li et al. 2006, Van Donk and Van Der Vaart 2005). The oil and gas industry is a volatile industry with a high cost if there is downtime in production, services are therefore needed at short notice for example if a lifting crane broke down on a platform and the short notice of the request creates uncertainty. Flexibility is therefore important to cope with the dynamic nature of the demand (Angkiriwang, Pujawan, and Santosa 2014). This also accounts for if service companies need to hire more qualified personnel from their suppliers to handle demand peaks.

Flexibility is a strategy used by companies to cope with changes in demand, changes that occur during the execution of a service and changes in the surroundings which have an impact on execution of the service. Koste and Malhotra (1999) state that flexibility can be either reactive or proactive as the two base strategies for flexibility. The reactive strategies are those in which the company face uncertainties both internally and externally. While the proactive one is about redefining the market uncertainties or influencing the customer's expectation of the industry (Angkiriwang, Pujawan, and Santosa 2014).

Flexibility for a company is often a costly affair; however, it is also rewarding to have appropriate levels of flexibility for companies working in uncertain markets. Merschmann

and Thonemann (2011) discovered that companies with highly flexible supply chains perform better than companies with less flexible supply chains in a study done of German companies operating in uncertain environments.

Companies need to have the ability to adapt in order to satisfy changes in customer requirements, which will also give a higher service level according to Kumar, Shankar, and Yadav (2008). The service industry allocates resources to perform certifications or tasks that require human resources for performing the task. High resource utilization is therefore required to stay competitive in uncertain markets. Right levels of flexibility can contribute to better utilization of the resources and are therefore an important tool to use in uncertain and dynamic markets. Using flexibility to respond to changes in demand reflects responsiveness to changing customer needs and wants (Duclos, Vokurka, and Lummus 2003). One can either reduce uncertainties or improve supply chain flexibility to improve responsiveness for a company (Candace, Ngai, and Moon 2011).

It is possible to take parts of these descriptions and definitions of flexibility for the service industry and put them together to fit our purpose with this paper. For the service industry providing Enterprise of Competence and certifications for the oil and gas sector, flexibility can be defined as the ability of a company to adapt to changes in the demand, changes that occur during the execution of the service and changes in surroundings which have an impact on execution of the service.

12.0 Case description

The case company is a global actor as a service provider to the oil and gas industry. Services provided by the case company comes through different solutions of asset integrity by discovering errors before they occur, doing this by controlling and monitoring equipment essential for the operation of their client. Clients for the case company are major drilling and operating companies. The company has different departments with different specialities. However, in this paper, we will only focus on the department for asset integrity management.

Flexibility from the case company is needed when they receive a work order request from their client, working at a remote location, this person does not always know what is

required of services and certifications at the given location. The client's personnel working offshore will most of the time demand more work scope after the initial work scope has been set. This generates a lot of uncertainty for the case company, both in terms of planning and determining what type of personnel is needed to fulfil the scope of work. To solve this issue, they dispatch personnel that are overqualified to do a job that does not initially require that high level of skill, in order to safeguard against the extra work scope that often occurs. The reason why they are utilizing this type of flexible strategy is to avoid more mobilizations towards different projects in cases where demanded tasks require more skills than planned. This strategy gives the case company the opportunity to take on the occurring extra work scope when/if it arrives while they already have the personnel at the site.

12.1 Project process

The case company are providing inspection management, certification of equipment, engineering solutions, risk-based inspections, maintenance management, quality control and structural integrity management as services to the oil and gas industry. They have many different customers. serving both domestic and international customers. Our focus for this paper has been on the Norwegian part of their operations, with a focus on the Asset Integrity Management department that provides a risk-based approach to ensure asset integrity for their clients. They perform different integrity management services and inspection services to help prevent incidents compromising the safety of both assets and personnel.

Each project has an early involvement of customers and engineers to develop the specification of the scope of work to be performed. People won't be allocated to the work before there is an agreement between the client and the project manager, often in the form of a purchase order. The project process has different stages, step 1 is to create a quotation, and make an offer to the client on performing the scope of work. Step 2 starts by receiving a purchase order, step 3 is to start the planning process of the job, allocating the right resources to perform the task. Step 4 is to have a start-up meeting with both the client and the executing personnel, going through the plans and sorting out possible issues and resolving these before the personnel gets dispatched to perform the work offshore. Step 5 is to perform the work offshore, while step 6 is to close the project with reporting, documentation, and invoicing. The changes in the contract/project can occur at all stages

except the last stage. Changes often come from the customer rescheduling the work, forcing the case company to be flexible by making adjustments in personnel, often creating a bullwhip effect, affecting projects further down the line.

Figure 1 show the process map explained above. The green arrows illustrate when the projects go as planned. The red arrows illustrate where changes can happen in the project.

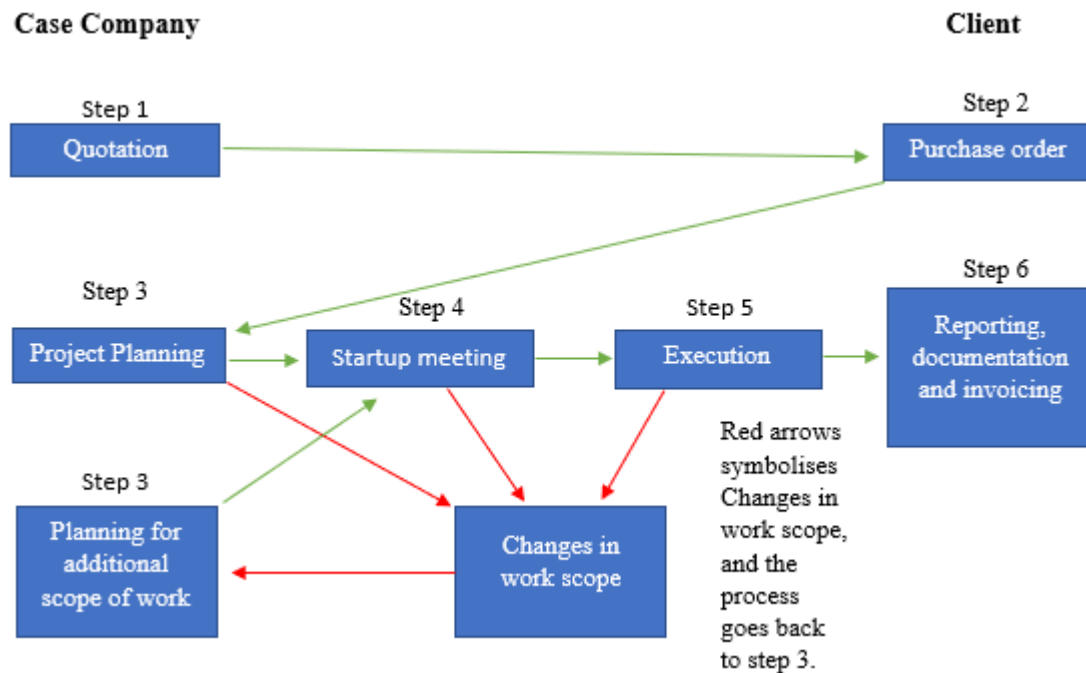


Figure 1: Process map

13.0 Methods and data

13.1 Data Collection

Data provided are retrieved from the ERP systems of the case company, where we collected information from 90 different projects in the period 2020-2022. The collected data came from two different sources, one was the intended amount of work which was quoted to their customers. The second was the actual amount of work performed on each project. The differences between quoted and what was performed can be seen as an expression of flexibility. We had some control variables, being three different customers (Customer 1, 2 and 3) and four different work types (EoC, NDT, LEC and Other).

The different variables collected are both economic and time variables:

Personnel Flexibility (PF), Mobilization Flexibility (MF), Onshore Flexibility (ONF), Offshore Flexibility (OFF), Rent Flexibility (RF), Turnover Flexibility (TF) and Profit Margin (PM).

Personnel flexibility

Personnel flexibility (PF) is the variable showing the differences in personnel quoted for the work scope, and what was invoiced to the client.

$$PF = \frac{(\text{Invoiced personnel} - \text{Quoted personnel})}{\text{Quoted personnel}}$$

Mobilization flexibility

Mobilization flexibility (MF) is a variable showing the differences in the number of mobilizations from quoted to the invoiced amount.

$$MF = \frac{(\text{Invoiced mobilizations} - \text{Quoted mobilizations})}{\text{Quoted mobilizations}}$$

Onshore flexibility

Onshore flexibility (ONF) is the variable showing the differences in the number of hours used against what was planned for onshore work.

$$ONF = \frac{(\text{Invoiced onshore hours} - \text{Quoted onshore hours})}{\text{Quoted onshore hours}}$$

Offshore flexibility

Offshore flexibility (OFF) shows the differences in the number of hours used against what was planned for offshore work.

$$OFF = \frac{(\text{Invoiced offshore hours} - \text{Quoted offshore hours})}{\text{Quoted offshore hours}}$$

Rent flexibility

Rent flexibility (RF) shows the difference between quoted rent and rent that was invoiced.

$$RF = \frac{(\text{Invoiced rent} - \text{Quoted rent})}{\text{Quoted rent}}$$

Profit Margin

Profit margin is the variable that shows the economic performance of a project. Profit is the percentage of the overall turnover in the project that is profit. This can vary from project to project, but the goal is to keep this as high as possible.

$$PM = 1 - \frac{Costs}{Turnover}$$

13.2 Data Analysis

The data is analysed with the help of different tools. Microsoft Excel has been used to collect and describe the data. Differences between the two data sources were compared using Microsoft Excel as a tool before importing the data to STATA for further analysis. Both correlation matrix and regression analyses were performed in STATA to answer the research question.

14.0 Results

The descriptive statistics (mean, median, standard deviation, minimum and maximum) is visualized in table 1. It is noted that mean vary between 0.11 and 0.54 while the median is varying between 0.00 and 0.76, and the standard deviations are between 0.15 and 1.60. The averages are not close to the median (central value) for all variables, implying that some of the variables have a skewness. Moreover, we also see from the levels of standard deviations that there are some variabilities in the distribution around the mean. The minimums vary from 0 and -1.00 and the maximum from 0.87 and 14.36, indicating some extreme values in the dataset.

	n=	Mean	Median	SD	Min	Max
Personnel Flexibility	90	0.11	0.00	0.30	-0.33	1.00
Mobilization Flexibility	90	0.16	0.00	0.42	0.00	2.00
Onshore Flexibility	90	0.37	0.00	1.57	-1.00	14.00
Offshore Flexibility	90	0.41	0.10	0.97	-0.47	5.83
Equipment Flexibility	90	0.44	0.76	1.32	-1.00	9.20
Turnover flexibility	90	0.54	0.24	1.60	-0.36	14.40
Profit margins	90	0.33	0.33	0.15	-0.18	0.87

Table 1. Descriptive statistics

In table 2 we see a correlation matrix that is including all variables. The correlation matrix shows that *offshore flexibility* has a significant correlation with *turnover flexibility*.

Indicating when *offshore flexibility* is increasing, so is the *turnover flexibility*. This also applies to the significant correlation between *onshore flexibility* and *offshore flexibility*.

Furthermore, the data also shows that *personnel flexibility* is significantly correlated with *mobilization flexibility*, *offshore flexibility* and *turnover flexibility* are significantly correlated with *rent flexibility*, *turnover flexibility* is significantly correlated with *onshore flexibility* and *offshore flexibility* is significantly correlated with *mobilization flexibility*.

	PF	MF	ONF	OFF	EF	TF	PM
Personnel Flexibility (PF)	1.00						
Mobilization Flexibility (MF)	0.496*	1.00					
Onshore Flexibility (ONF)	0.041	0.144	1.00				
Offshore Flexibility (OFF)	-0.01	0.274*	0.703*	1.00			
Equipment Flexibility (EF)	0.09	0.053	0.149	0.258*	1.00		
Turnover Flexibility (TF)	0.007	0.129	0.948*	0.831*	0.238*	1.00	
Profit Margin (PM)	-0.08	-0.08	-0.012	-0.111	-0.02	-0.004	1.00

Table 2: Correlation Matrix

Correlation coefficients significantly different from 0 at level 0.05 are marked by *, using the rule of thumb $|r_{xy}| > \frac{2}{\sqrt{n}}$ to assess significance.

In table 3 there is performed two regression analyses¹. Model 1 (M1) and model 2 (M2). M1 is calculated with *turnover flexibility* as the dependent variable and *offshore flexibility*, *onshore flexibility*, *rent flexibility*, *mobilization flexibility* and *personnel flexibility* as the independent variables. M1 shows that *offshore flexibility*, *onshore flexibility*, and *mobilization flexibility* are all significant with $P < 0.05$. M2 are performed with *profit margin* as the dependent variable and project groups, customers, and all flexibility variables as the independent ones. We also have some control variables being the different project groups and the different customers. The results show that Customer 2, *offshore flexibility*, and *turnover flexibility* are significant with $P < 0.05$. The reference categories for the control variables are Project Group EoC and Customer 3.

¹ Breusch-Pagan test indicates heteroskedasticity. To adjust for heteroskedasticity, Newey-West standard errors are used in t-tests.

	Model 1	Model 2
<i>Dependent variables</i>	Turnover flexibility	Profit Margin
<i>Independent variables</i>		
ProjgroupLEC		0.020
ProjgroupNDT		0.0009
ProjgroupOther		0
ProjgroupEoC		-0.022
Customer 1		0
Customer 2		0.101**
Customer 3		0.053*
Offshore flexibility	0.562***	-0.090***
Onshore flexibility	0.727***	-0.042
Rent flexibility	0.056	-0.006
Mobilization flexibility	-0.288**	0.046
Personnel flexibility	0.079	-0.042
Turnover flexibility		0.087**
Adj R ²	0.956	0.012

Table 3: Regression analysis of flexibility

Note that *p<0.1; **p<0.05; ***p<0.01 and 0=Reference category.

15.0 Discussion

In the correlation matrix, the results show that there are several variables that are significantly correlating. Firstly, we see that *personnel flexibility* is significantly correlating with *mobilization flexibility*. This is natural, when needing more mobilizations, one will also need more personnel to perform the work scope, the first personnel being on the prior mobilizations often can't come for the second mobilization. Secondly, *offshore flexibility* and *mobilization flexibility* are significantly correlated, when there are required more mobilizations in a project, one will also need to be more flexible when it comes to the hours offshore. Thirdly, the results show that *offshore flexibility* is significantly correlated with both *onshore flexibility* and *turnover flexibility*, meaning that more hours worked offshore often require more work at the office onshore as well, also resulting in a change in *turnover flexibility*. Fourth, the results show that *turnover flexibility* is significantly correlated with *onshore flexibility*, *offshore flexibility* and *rent flexibility*. This means that when flexibility is increasing in these three variables, the same happens for turnover. Lastly, we see that *rent flexibility* is significantly correlated with both *offshore*

flexibility and *turnover flexibility*, meaning that it seems that equipment rent is highly dependent on changes in the project. With more hours offshore and higher turnovers, the more will the rent of equipment increase. All these results show that the correlation between different variables needs to be considered when investigating the impact of flexibility in each variable.

The dependent variable *turnover flexibility* is tested against all other flexibility variables in M1. However, there are only three of the independent variables that turned out to be significant, which were *offshore hours flexibility*, *onshore hours flexibility* and *mobilization flexibility*. M1 is indicating that *mobilization flexibility* seems to have a negative impact on the *turnover flexibility*. Meaning that by being flexible with several mobilizations, the turnover is negatively impacted. While for the other variables in M1, the indications show a positive impact on turnover. With more flexibility in onshore and offshore hours, it is indicated that *turnover flexibility* is positively impacted. Indicating flexible turnovers in a positive direction by being flexible. Moreover, flexibility regarding personnel and equipment rent doesn't mean that they will increase their turnover. These variables don't have a significant impact on M1 and can therefore not be said to be positive for turnover.

With M1 showing three significant variables, the investigation is therefore indicating that flexibility, in general, has an impact on turnover. *Flexibility in turnover* is used by the service provider to handle changes in projects, three of the variables for flexibility turned out to be significant, one was negative and two were positive. This may indicate that changes in projects can have a positive impact on turnover. This is the opposite of general considerations around unexpected changes in projects (Verweij and Meerkerk 2020). However, when the service provider has a strategy for using flexibility to handle changes with flexibility, this can be a competitive advantage with a positive impact on turnover. Flexibility is stated to have a positive impact on the non-financial performance measures from previous research (Arias-Aranda 2003). Ketkar and Sett (2009), (2010) also stated that one can see a positive difference in firms' performance when being flexible. Underlining that there is also an indication that flexibility tends to improve revenue in projects that are flexible. Research states the importance of being flexible to exploit advantages and opportunities quickly and efficiently that come from the environment (Dreyer and Grønhaug 2004, Levy and Powell 1998). This previous research substantiates

our investigation that the ability to be flexible can increase revenues by being able to exploit different opportunities that occur.

It is a well-known fact that oil and gas companies have high leverage power over their suppliers, meaning that a service provider to this industry has little power over its clients and the market is distinguished by an uncertain nature. As indicated by Hitt, Keats, and Samuel (1998), flexible strategies are especially important in markets characterized by a high degree of uncertainty. Having a flexible strategy is therefore important to exploit the opportunities for increasing revenue and new contracts as they come. A flexible strategy is therefore positive with this indication. The case company doesn't have the power to do something about the uncertainty in the market, and therefore, a reactive strategy for dealing with uncertainty is indicated to work well for the company by increasing revenues. This strategy is often used to maintain service levels and/or efficiency (Angkiriwang, Pujawan, and Santosa 2014). Moreover, with this indication, one sees that being flexible also provides a competitive advantage and a benefit for the case company.

The M2 model is investigating the impact the different variables and control variables have on the dependent variable *profit margin*. However, some research shows that an increase in revenue also tends to increase costs and decrease profits margins (Maveric 2021). In M2 the results indicate that *offshore flexibility* is significantly impacting the *profit margin* in a negative way. This is similar to previous research, stating that flexibility can provide a competitive advantage, however, being costly (Pujawan 2004, Gupta and Goyal 1989, Koste and Malhotra 1999, Merschmann and Thonemann 2011). Flexibility is improving the non-financial performance as stated by Arias-Aranda (2003). This indicates that even though we see a negative impact from *offshore flexibility*, it can be discussed that being flexible is beneficial to increase the satisfaction of their clients. For companies to perform well in an uncertain market, it's important to make use of the extra work scope that occurs, and with satisfied clients, the opportunity of gaining more work is increasing. Flexibility in offshore hours is measured in time, while profits are a financial variable measured in Norwegian Kroner (NOK). If we had been able to see all variables in NOK, the results may turn out differently. However, we still see a significant impact with the data that we have.

Turnover flexibility is also indicated by M2 to have a significant impact on *profit margin* ($P < 0.05$). Being able to increase the amount invoiced according to what is planned will yield higher profits. This indication also substantiates the finding from Sanchez (1995), that flexibility can be used to gain a competitive advantage. This competitive advantage comes through increased turnover and a positive impact on profits. The positive impact turnover has on *profit margins*, shows that if companies providing services to the oil and gas industry can gain more work and seize the opportunities that occur, they can increase turnover and improve their profits.

The indications of the *turnover flexibility* and *offshore flexibility* are seen isolated to see the impact these two have on *profit margin* if other variables don't change. However, this needs to be seen in relation to the correlation matrix. In this matrix, the results show that *offshore flexibility* and *turnover flexibility* are strongly correlated (0.83). This indicates that when the flexibility in offshore hours is higher, so is the turnover flexibility. Meaning that the indication of a decrease in *profit margin* caused by higher *offshore flexibility* will eventually be zeroed out when the *turnover flexibility* is also increasing. Therefore, this indicates that a flexible strategy is typically increasing overall turnover while keeping the same levels of profit margins in the projects.

In M2, the investigation also revealed an indication that Customer 2 has a significant impact on *profit margin*. This indicates that this customer is more profitable to work with than the other customers investigated. It's known that companies tend to have different contracts and cost rates with different customers. Indicating that the case company has a favourable contract and rates with this customer. The case company should see whether this contract is built in another way than the others, being favourable in ways that easily can be adapted to other contracts and customers as well.

Previous research states that companies need to have a certain level of flexibility to perform in their respective markets. We have found indications in our investigation that a flexible strategy has a positive impact on the economic performance of the case company. However, if they should change their strategy for flexibility is difficult to predict since the levels of flexibility within projects aren't measured.

Limitations

This research includes a possibility of common method bias due to the perceptual data only being collected from a single data source. Moreover, the levels of flexibility aren't measured, and it is, therefore, difficult to see whether these levels have an impact.

Future research

We have not explored the possibilities to measure the flexibility levels, to see whether different levels of flexibility have different impacts on economic performance. Moreover, future researchers should also have the possibility of testing for service providers in different markets and see if the results can be standardized in some way. It should also be considered to extend this study including more service providers and a larger sample.

16.0 Conclusion

In this paper, we have investigated the impact flexibility has on the economic performance of a case company that is providing services for the oil and gas industry. In differ to previous researchers, we have shown how a flexible strategy has an impact on economic performance. Moreover, M2 indicates that flexibility in offshore hours has a negative impact on profit margin. However, this needs to be seen together with the correlations, showing that *turnover flexibility* and *offshore flexibility* are strongly correlated, often increasing together and *turnover flexibility* having a positive impact on profit margins. This together indicates that the economic performance is improving with a flexible strategy through increasing turnovers while keeping the same level of *profit margin*.

17.0 References

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