Master's thesis

NTNU
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Organizational Consequences of Industrial Data Sharing

A case study of industrial data sharing in the oil and gas industry

Master's thesis in Management of Technology
Supervisor: Roar Stokken
May 2019

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Kunnskap for en bedre verden

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"To think it, wish it, even want it —

but do it! No, that I cannot understand."

— Henrik Ibsen, Peer Gynt

Preface

This master's thesis is written as a part of a Master of Science in Management of Technology at the Norwegian University of Science and Technology.

We would like to thank Aker BP, Framo and Cognite for the time and effort they put into making this thesis possible. We would also like to thank our supervisor Roar Stokken for his help and guidance throughout the entire process.

Trondheim, 23. mai 2019

Einar Kanestrøm Langørgen

Jonas Nilsberg Refsnæs

The researchers of this thesis are accountable for its content

Abstract

In today's increasingly competitive markets, organizations are contingent on being capable of changing in order to secure future wealth. A common strategy is to reshape internal and external processes and to shift the organization's strategic focus to become more cost-effective. Determining where the new strategic focus should be, and which changes the organization must implement is no easy task. Organizations today show an increasing interest in industrial data sharing, which is the notion that data should be shared between organizations in order to fully utilize its potential, and thereby increasing each other's organizational performance. A variety of theoretical approaches exists to steer and plan strategic change initiatives like this, both within the strategic management and change management literature, which are the overlying theoretical perspectives of this thesis.

The presented research is a qualitative case study focused on answering the following problem formulation: *What are the organizational consequences of industrial data sharing?* The research in this thesis has been conducted within three Norwegian companies whom together are working on projects linked to industrial data sharing. Hereunder the oil exploration and development company Aker BP, one of their equipment suppliers Framo and the information technology company Cognite. Data were gathered through semi-structured interviews with key personnel within these three organizations.

Key findings show that industrial data sharing was a major shift in the organization's strategic focus and that a significant change initiative followed the implementation. Wherein it became evident that three factors were especially notable for the change initiatives success. Hereunder, vision and leadership, people and orchestration, and data liberation.

It became evident that the conventional strategic management literature is poorly suited for strategizing and planning for industrial data sharing, while the industrial network perspective was regarded as a better fit. Furthermore, it became apparent that Kotter's (1995) framework for change management was well-suited for planning, implementing, and leading change efforts in regard to industrial data sharing.

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1. Introduction

In today's increasingly competitive, globalized, and dynamic markets, organizations face an intensifying economic pressure to adapt to accelerating change. In order to efficiently react and respond to the external environment, in which they operate, organization's shift their focus, change their goals and reshape internal and external processes. In other words; change the way they operate. Adaptive efforts such as these are more often than not referred to as change management and are described by Moran & Brightman (2000, p. 66) as *"[...] the process of continually renewing an organization's direction, structure, and capabilities to serve the ever-changing needs of external and internal customers".* One of the many challenges linked to change is understanding its drivers and what makes it successful, especially during the implementation phase. Why are some organizations more successful at change initiatives than others? Over the years, several models have been created in order to steer this restructuring process. Wherein the model, which perhaps is most commonly accepted by business leaders, is the very practical eight-step model created by Kotter (1995).

Organizational change and organizational strategy cannot be separated from one another (Burnes, 2009; Rieley & Clarkson, 2001) where change is the implementation of the strategy. A strategy is an organization's plan of action to successfully achieve one's aims and visions. One does not go into battle without a plan, without a strategy. Several perspectives within the strategic management literature exist, with different applications, for example, the competitive forces framework (Porter, 1980), the resource-based view (Barney, 1991; Wernerfelt, 1984) and the industrial network perspective (Håkansson & Snehota, 1989). Due to this, managers often have to ask themselves which perspective or framework best suits their particular situation. Does one framework suit every situation? It is therefore essential to study different perspectives within the strategic management literature in the context of different situations, in order to map the model's strengths and weaknesses. So that one can make better decisions when developing future strategies.

1.1 Research Context

The research of this thesis has been conducted within three Norwegian companies, which together are working on the implementation of industrial data sharing. Industrial data sharing is the notion that data should be shared between organizations in order to increase each other's performance. The companies which are studied in this thesis are the oil exploration and development company Aker BP, one of their equipment suppliers Framo, and the information technology company Cognite. However, most of the empirical data has been gathered from Aker BP.

The oil and gas industry experienced in 2014 a severe drop in oil prices which would shake the entire industry. Employees were terminated, and companies ran out of business. In this time of crisis, Aker BP realized that their way of doing business was not sustainable in a low-price setting, triggering the need for change. Consequently, a new strategy was developed consisting of four main focus areas; reorganizing the value chain with strategic partnerships and alliances, building a value chain based on a shared LEAN understanding and culture, constructing a flexible business model ready for growth and volatility, and be at the forefront of digitizing exploration and production. All of these four areas are somewhat connected and benefits the other. The very last strategic focus area, namely, to be at the forefront of digitizing exploration and production, will be the focal point of the thesis at hand.

One company's exhaust data might be another company's gold. Every day, Aker BP collects equipment data from thousands of data points. Data which traditionally has been ignored and stored in silos. The notion that live and historic equipment performance data is strictly confidential capable of creating strategic advantages has been dominating the industry. Today, Aker BP do not possess the capabilities to extract any significant value out of the data. While the suppliers who manufacture and conducts much of the maintenance on the equipment, the ones who actually possess the capabilities to extract value from the data, have previously not had any access to the equipment's performance data, making it close to useless. In order to stimulate their new strategy, Aker BP moved away from this traditional notion and instead decided to provide and share its equipment exhaust data with its suppliers, realizing that they were not capable of exploiting the data on their own. Thereby initiating a data sharing pilot project with the equipment supplier Framo. The pilot project uses a contract design where

Framo gets paid for equipment uptime and performance, instead of getting paid for each maintenance conducted in a calendar-based cycle — leaving the equipment uptime responsibility with Framo. In return, Framo receives live and historical performance data of the equipment, which enables them to optimize equipment operation in new and innovative ways. This is made possible through a data platform created by Cognite, which contextualizes the data and makes it easily accessible for the supplier.

With this, Aker BP hopes to cut total equipment costs, increase safety, and decrease risks linked to production shutdown. They also hope to implement this contract form on all of their equipment. However, this is just a vision, and it is too early in the pilot to say if the investments will have any return for the parties. Getting to the endpoint which Aker BP has envisioned requires disruptive innovations, inter-organizational collaboration, and change.

1.2 Research Aim and Problem Statement

The aims of this thesis are ternary. First, to explore the reasons behind the decision of sharing data. Second, to map the status-quo of the organizational changes the stakeholders have conducted in order to better share and receive data. While thirdly investigate how inter-organizational relations change as a consequence of industrial data sharing. The overarching goal of the thesis is to answer the following problem statement:

What are the organizational consequences of industrial data sharing?

In order to design a proper methodological approach, and with the aims of the thesis in mind, three research questions have been formulated for the problem at hand:

1. For what reasons do the stakeholders share industrial data?
2. Which organizational changes have the stakeholders conducted in order to share and receive data, and how did they implement them?
3. How do the stakeholders perceive changes in inter-organizational relations in the ecosystem due to industrial data sharing?

1.3 Theoretical Relevance

In this subchapter, an overview of the theoretical concepts used to discuss and understand the core of the empirical results is provided. A collection going into greater detail of the theoretical perspectives used can be found in chapter two. The focal theoretical perspectives for this thesis are information theory, strategic management, and change management.

Even though industrial data sharing is currently making a significant impact on the business world, not much theoretical research on the notion has been conducted. The chosen combination of research perspectives seeks to identify and understand the underlying reasons for why the organizations decided to share their data. Which organizational changes organizations undergo to successfully share, receive, and extract value from it. While at last, understand how the relationship between data sharer and reciever changes. First and foremost, the data-information-knowledge-wisdom hierarchy (DIKW-hierarchy) will be used in order to establish how data sharing creates value, and why the stakeholder's organization decided to share data (Chaffey & Wood, 2005; Rowley, 2007), which creates the foundation for the rest of the discussion.

After that, two different schools within the strategic management literature is discussed in the context of industrial data sharing. Hereunder, the conventional strategic management (Barney, 1991; Porter, 1980; Wernerfelt, 1984) and the industrial network perspective (Håkansson & Snehota, 1989). Both these schools within the strategic management literature are polarizations to one another, and by using both as tools for discussion, a more in-depth understanding is made of the case at hand.

Various scholars have studied organizational change since its introduction as a field of research. In this thesis, Kotter's (1995) recognized eight-step model is used as a framework for discussion. This is to identify and understand the steps which the stakeholders have taken in order to share and receive data successfully. Industrial data sharing induces a transformation process, and Kotter (1995) argues that organizations need to undergo eight steps in order to successfully change.

Little to no previous studies describe the effect of industrial data sharing on organizations in relation to strategic management and change management. Very little research on the effects of industrial data sharing exists in general. This study, therefore, brings new insights into which frameworks researchers should use in order to better understand phenomenon linked to industrial data sharing. As well as, which strategic frameworks one should use in order to develop theories within the context of industrial data sharing. Moreover, the main contribution in regard to change management is that of recommendations for which frameworks researchers could use in order to better understand the change initiative that follows industrial data sharing.

1.4 Practical Relevance

A report published in 2017 by the World Economic Forum (Spelman et al., 2017) in collaboration with Accenture claims that digitalization as a whole has the potential of unlocking 1.6 to 2.5 trillion USD in value for the oil and gas industry and its ecosystem. While a study conducted by McKinsey & Company in 2013 (Manyika et al., 2013) reveals that data sharing or open industrial data can unlock 240 to 510 billion USD in value annually in the United States oil and gas industry alone. Both of these studies reveal that vast amounts of value are potentially there for the industry and its ecosystem to seize. However, these values can only be unlocked through data access and data reliability, which according to a recent study conducted by DNV GL, is fundamental for the digitalization of the oil and gas industry (DNV GL, 2019). The same report reveals that the top priorities in 2019 for organizations within the oil and gas ecosystem all relate to data sharing and access.

A recent McKinsey & Company study reveals that decision makers on a single oil rig with thirty thousand data points only examines and evaluates one percentage of the data collected when making decisions (Deichmann et al., 2016). Much to blame is the lack of organizational structures and procedures specifically designed to work around vast amounts of data. Many organizations do not realize the sheer potential value of the data they collect, nor understand how they as an organization must change in order to extract its value. By exploring the reasons which drove Aker BP to share their equipment's performance data with its suppliers, one hopes to understand where value can be unlocked, and how it creates value. By further investigating

the stakeholder's organizational changes, one hopes to understand how organizations must change in order to best extract value of industrial data sharing — knowledge which other organizations hopefully can benefit from, be it data sharers or data receivers.
In 2018 Everis Benelux conducted a study of data sharing between organizations within Europe on behalf of the European Commission (Arnaut et al., 2018). This study did not target the oil and gas industry alone but targeted a broader set of organizations. The study provided substantial evidence that industrial data sharing generates large amounts of value in all industries wherein it was implemented and expects data sharing and data receiving between organizations to grow exponentially in the future. Redefining the way organizations do business with one another.

This thesis brings new practical insight into how organizations should work with strategic management and change management in the context of industrial data sharing — benefitting from the practical experiences from Aker BP, Framo, and Cognite. Further managerial recommendations are provided at the end of the thesis in chapter 6.2.

2. Theory

This chapter presents the theoretical perspectives which are relevant for understanding the threshold of the case at hand. These perspectives make the foundation for which the discussion in chapter five is based upon. The purpose of this thesis is to study the organizational consequences of industrial data sharing, wherein both internal and external consequences are within the scope of the thesis at hand. Therefore, this chapter is structured within the theoretical perspectives of information theory, strategic management, and organizational change management.

2.1 Information Theory

This section reviews the literature related to information theory. Firstly, a model which describes the relationship between data, information, knowledge, and wisdom are put forth to get a deeper understanding of how they are interconnected. Secondly, several theories about data-driven decision making are presented, which emphasizes the value of information for decision-makers.

2.1.1 DIKW Hierarchy

The data-information-knowledge-wisdom hierarchy (DIKW-hierarchy), also commonly known as the knowledge hierarchy, the information hierarchy, and the knowledge pyramid is one of the most central and generally accepted models within information and knowledge literature (Rowley, 2007). The hierarchy consists of four building blocks, namely, data, information, knowledge, and wisdom. The hierarchy is illustrated as a pyramid below, where each of the higher building blocks in the hierarchy includes the building blocks that fall below it (Ackoff, 1989; Chaffey & Wood, 2005). This means that data makes the foundation for which information, knowledge, and wisdom is built upon.

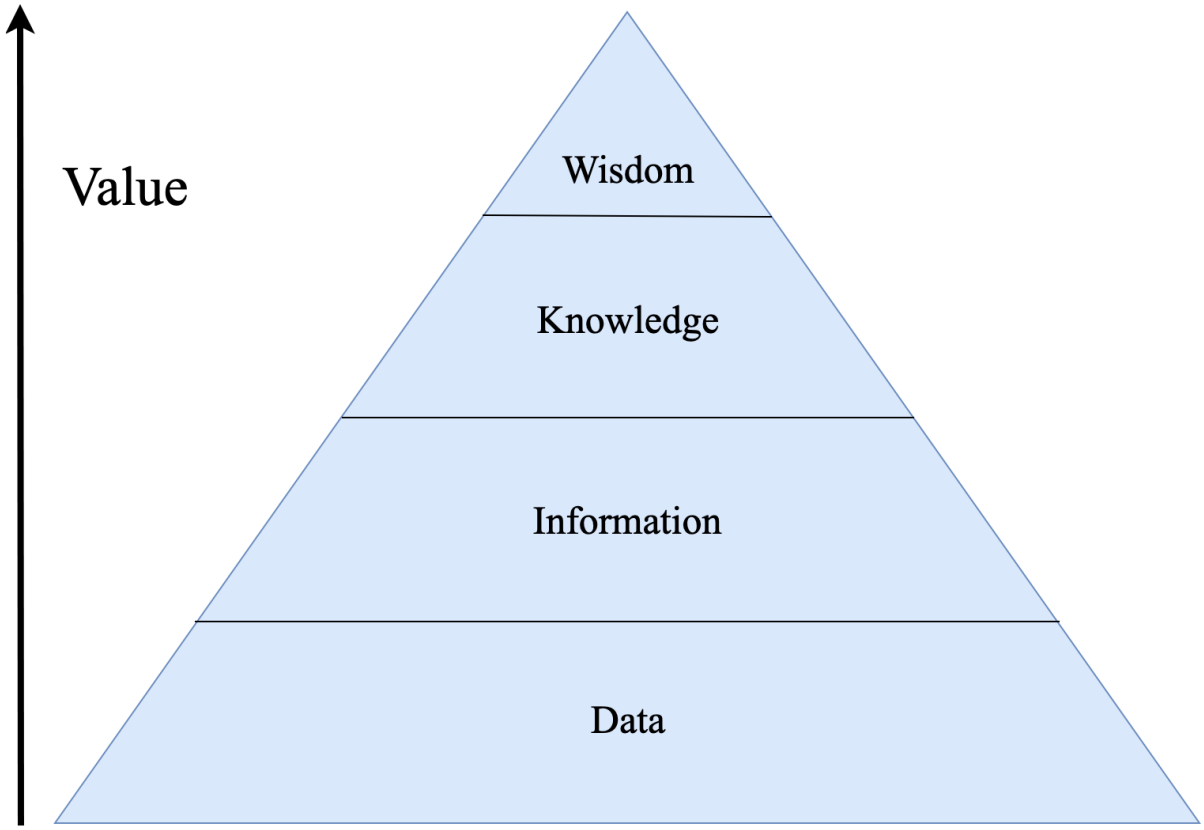

Figure 1 - DIKW Hierarchy

Chaffey & Wood (2005, p. 263) describes data as *"[...] discrete, objective facts or observations, which are unorganized and unprocessed, and do not convey any specific meaning"*. Data is turned into information when it becomes organized and structured in such a way that it brings relevance to a specific context or purpose (Rowley, 2007). In other words, *"[...] adds value to the understanding of a subject"* (Chaffey & Wood, 2005, p. 263). Information is the basis for knowledge, which *"[...] is the combination of data and information, to which is added expert opinion, skills, and experience, to result in a valuable asset which can be used to aid decision making"* (Chaffey & Wood, 2005, p. 263). Wisdom is positioned on the pinnacle of the hierarchy and is much more debated than its predecessors (Rowley, 2007). However, Rowley (2007, p. 177) summarizes this debate, describing wisdom as *"[...] the capacity to put into action the most appropriate behavior, taking into account what is known (knowledge) and what does the most good"*. That is to say; wisdom can be regarded as actionable knowledge. With all of this in mind, it can be said that the more meaning and context the data is given, the more knowledge and insight it brings, the more valuable it gets (Chaffey & Wood, 2005).

2.1.2 Data Driven Decision Making

When researching theories about information's value, the well-recognized work of Blackwell (1953) frequently arise. He described a situation where a decision maker tries to determine which end state a stochastic process terminates in, to select the actions which give the highest reward when the termination state is reached. If the decision maker knows with absolute certainty which end state the process ends in, so-called perfect information, the decision process is reduced to a simple dynamic programming problem. However, decision-makers seldom know with certainty which end state occurs. Blackwell (1953) therefore presented an approach for describing whether or not a set of imperfect information was superior to another, based on the notion that a decision maker acting rationally on better information should achieve a higher expected reward (Blackwell, 1953; Brynjolfsson, Hitt & Kim, 2011), stating that improved information always improves performance.

Galbraith (1973) put forth a different perspective complementing the previous research of Blackwell (1953). He claimed that *"[...] the greater the task uncertainty, the greater the amount of information that must be processed among decision makers during task execution in order to achieve a given level of performance"* (Galbraith, 1973, p. 4). He, therefore, argued that organizations performing complex tasks should be oriented towards effective information processing and that the usage of technologies that allow for more information collection or increases the ease of distributing information within an organization ought to improve performance and lower costs. A more recent study conducted by Brynjolfsson, Hitt & Kim, (2011, p. 1) concluded that *"[...] firms that adopt data-driven decision making have output and productivity that is 5-6% higher than what would be expected given their investments and information technology usage"*, supporting Blackwell's (1953) and Galbraith's (1973) previous statements.

To cope with uncertainty and increased information, organizations typically use two different strategies. Either reducing the effect of uncertainty by adding or developing buffers or reducing uncertainty through increased information flow (Galbraith, 1973; Premkumar, Ramamurthy & Saunders, 2005). The first strategy is often operationalized by increasing the magnitude of the budget, inventory or lead time to cope with the uncertainty, while the second is to create information channels which send information from the point of origin to the where the decision rests.

2.1.3 Summary

The DIKW-hierarchy describes the connection between data, information, knowledge, and wisdom, and describes the necessary steps in order to transform one to another, thereby increasing its value. The theoretical foundations for data-driven decision making were presented as well. Here it was established that increased and better information leads to higher expected reward when dealing with uncertainty (Blackwell, 1953; Brynjolfsson, Hitt & Kim, 2011; Galbraith, 1973).

2.2 Strategic Approach

In order to understand the organizational consequences of industrial data sharing, it is crucial to understand the underlying strategies or the motives behind data sharing, which is why this chapter presents two different perspectives within the strategic management literature. First, the standard conventional strategic perspective is presented; here, gaining a competitive advantage over others is the sole focus. After that, the industrial network perspective is introduced, which focuses on organizational performance, collaboration and inter-organizational mutualism.

2.2.1 Conventional Strategic Management

The fundamental underlying question in the strategic management literature is how organizations achieve and sustain competitive advantage over others (Rumelt, Schendel, & Teece, 1994). Similarly, Daft (2016, p. 52) claims that *"[...] the overall aim of strategic intent is to help the organization achieve a sustainable competitive advantage"*. Wherein competitive advantage relates to attributes which separate one organization apart from others and provides an edge when meeting customer needs (Daft, 2016). Survival of the fittest has been dominating the literature, and it is more often than not argued that *"[...] strategy is about winning"* (Grant, 1998, p. 3). Since the early rise of strategic business management in the nineteen sixties, quite a diverse body of contributors has formed and clustered around a few different schools (Teece, Pisano, & Shuen, 1997). To illustrate how the focal point of strategic management has been to gain a competitive advantage over others, two famous clusters is presented below.

The first school is the approach of the competitive forces, namely the framework of Porter's five-forces (1980). This framework analyizes an organization's competitive position in an industry and takes into account five forces which Porter (1980) argues that together shapes and influences an industries profitability. These five forces are the bargaining power of suppliers, the bargaining power of customers, threat of substitutes, threat of new entrants, and existing rivalry. Notably, this framework views both the powers of buyers and suppliers as potential threats for the organization's success, on the same level as actual competitors. The framework, therefore, tries to gain power over these forces and to be less dependent on them (Gadde, Huemer & Håkansson, 2003). Strategies are, therefore, often aimed at changing the organization's position in regard to competitors and suppliers (Porter, 1980). Thereby implying that any inter-organizational relationship has a winning and a losing side in a zero-sum contest, even relationships with suppliers who organizations more or less are dependant upon.

The second school within the conventional strategic management doctrine is the resource-based perspective, which first was introduced by Penrose (1959), who presented the idea of looking at organizations as a broader set of resources. The most significant contribution to this cluster is perhaps Wernerfelt's (1984) approach in regard to analyzing organizations from a resource perspective rather than a product perspective. In his paper, Wernerfelt (1984) argues that in order to create a competitive advantage over others, organizations should aim to acquire and

control resources, which is attractive to other actors in the market. The resource-based research builds on the classical assumption or the idea that resources which are idiosyncratic or superior relative to those of other organizations can become the foundation for which competitive advantage is built upon, if the resources are matched accordingly to the environmental situation (Andrews, 1971; Barney, 1991; Thompson & Strickland, 1990; Petraf, 1993). Barney (1991) stated that for resources to be able to create a competitive advantage, they would have to be valuable, rare, imperfectly imitable and not substitutable. In other words, managers must choose strategies which best utilize the internal resources relative to external opportunities to gain a competitive advantage.

Both these frameworks use a different approach, but both build on the same basis that organizations should obtain a competitive advantage over others. Wherein the logic seems to be that our resources are our own and only ours, and all other organizations are threats to our profitability.

2.2.2 Collaboration in Industrial Networks

In contrast to the perspectives that strategy is solely about obtaining a sustainable competitive advantage over others, there is the industrial network model (Håkansson & Snehota, 1989). Here the condition of competition and rivalry between organizations is of less importance, while characteristics such as coevolution and inter-organizational mutualism are the focal point (Gadde, Huemer & Håkansson, 2003). Based on the idea that no organization is complete, and therefore, not in control of all the competence and resources it needs in order to operate. Hence, they are dependent upon the competence and resources of its suppliers to be able to operate satisfyingly (Ford, 2011). In other words, the perspective suggests that organizations operate in networks of suppliers, customers, and competitors which gives context to an ecosystem in which the organization operates (Gadde, Huemer & Håkansson, 2003; Håkansson & Snehota, 1989). The same relationships, therefore, influence the result of the organization's actions and are potential sources of increased performance and efficiency (Gadde, Huemer & Håkansson, 2003; Håkansson & Snehota, 1995; Wilkinson & Young, 2002). Håkansson and Snehota (1989) with support from Baraldi et al., (2007) and Gadde, Huemer & Håkansson (2003) argue that consequently in order to understand what really drives organizational effectiveness and

performance, organizations must broaden their strategic focus from allocation and appropriation of internal resources to instead focus on the way the organization relates to its ecosystem and its resources.

The industrial network perspective emphasizes that strategic management is not merely concerned with the organization's competitors, but rather about coping with all of those its success depends upon, hereunder including its suppliers, customers as well as competitors (Ford, 2011). Gadde, Huemer & Håkansson (2003) argue that zero-sum contest types of relationships between organizations leads only to rivalry and conflict, and is, therefore, unbeneficial for both parties. Dwyer, Schurr & Oh (1987), hold that inter-organizational relationships can be defined within two categories: transactional exchanges and relational exchanges. Wherein purely transactional exchanges are characterized by very little communication and restricted content excluding relational aspects. Dwyer, Schurr & Oh (1987, p. 12) illustrate these types of exchanges by describing them as *"[...] a one-time purchase of unbranded gasoline out-of-town at an independent station paid for with cash"*. On the other hand, there are the relational exchanges, these transpire over time and has both a social and economic dimension to it (Dwyer, Schurr & Oh, 1987). The focus is not on the transaction itself, but instead on enhanced value creation for both parties through increased innovation, reduced costs, and so forth.

Vitasek (2016) take this one step further and introduces a new category called investments, as well as several models for procuring the necessary goods and services needed within those three categories. For this thesis, only two of them are relevant, namely the approved provider model and the performance-based model. The approved provider model is a transactional model where the supplier meets a set of predefined criteria before an exchange happens and little long-term relations are involved (Keith et al., 2016; Vitasek, 2016). The performance-based model also called pay for performance, incorporates a relational contracting model with an output-based economic model. Consequently, shifting the economic model from transactions to outputs measured by cost savings targets or process-based service level agreements. Additionally, performance-based contracts also shift the risk for achieving the output to the supplier (Keith et al., 2016; Vitasek, 2016).

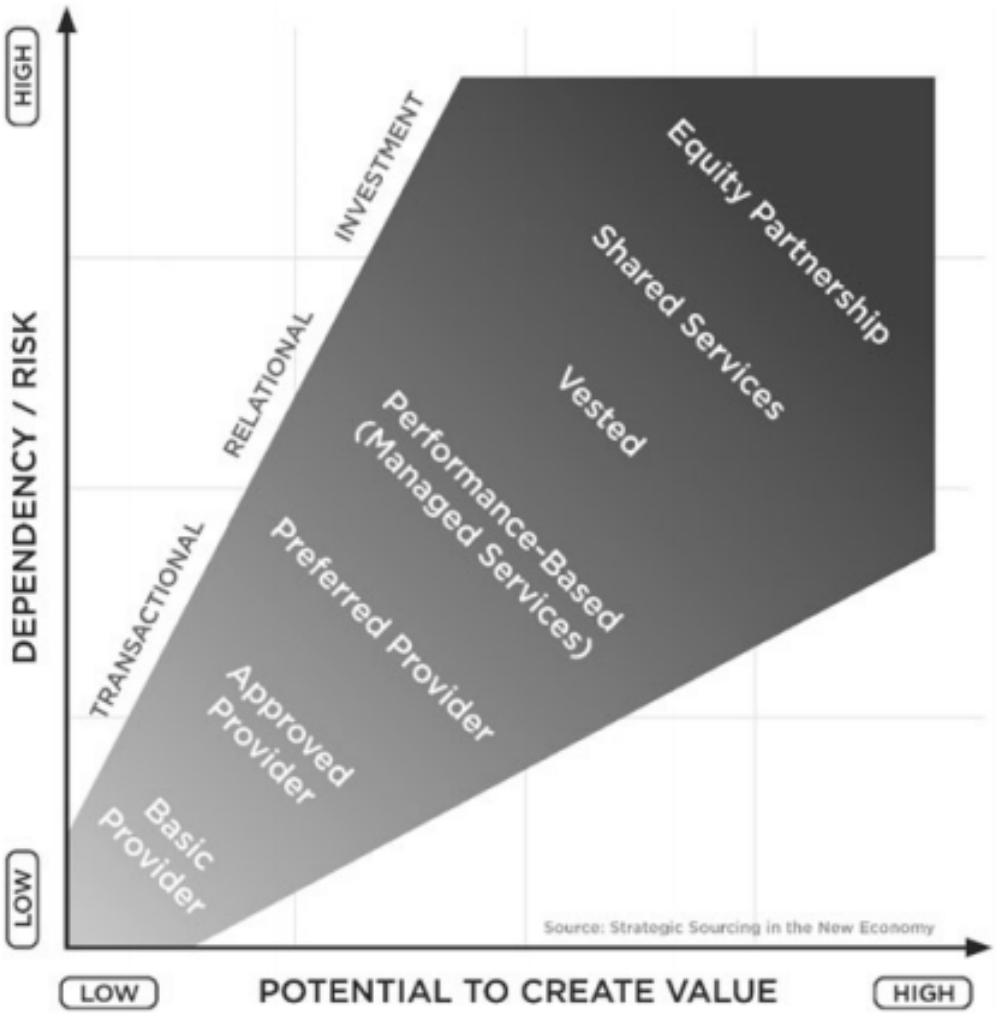

Figure 2 - Procurement models (Keith et al., 2016)

The benefits and significance of relationship building between organizations have been well documented within the research (Håkansson, 1990). Gadde, Huemer & Håkansson (2003) argue that resources have concealed and untapped dimensions, which only can be identified and utilized through interactions with partners. In other words, it is argued that resources can prove themselves even more valuable through relationship development. Gadde, Huemer & Håkansson (2003) further state that an organization's activities are more often than not dependent upon other organizations and that the coordination of activities and interdependencies in the network severely enhances organization's performance. Something which is exemplified by intensified attention to supply chain management and joint product development.

2.2.3 Summary

To summarize, one can see that the strategic management literature has, for the most part, been content with focusing on how organizations gain and sustain competitive advantage over others. As illustrated by the two clusters within the strategic management field which were presented, namely the competitive force approach (Porter, 1980), and the resource-based perspective (Penrose, 1959; Wernerfelt, 1984).

The second part of this subchapter disclosed the industrial network perspective, which in opposition to traditional strategic management urges for inter-organizational mutualism and collaboration (Håkansson & Snehota, 1989). The model argues that organizations must focus on the way the organization relates to its ecosystem and its resources, and how value can be created through coevolution and cooperation, which means that organizational performance is enhanced through relations with other organizations in the ecosystem (Ford, 2011).

2.2 Organizational Change Management - Kotter's Eight Steps

There is no denying that in order to keep pace with a rapidly changing and growing market, organizations are contingent on being able to innovate and adapt. Change is inevitable if organizations wish to survive and will be even more imperative in the future (Armenakis & Harris, 2009). Being able to evolve and adapt continually is, therefore, directly linked to organizations long- and short-term success. With that in mind, one would almost assume that change is a core competence in itself. However, research implies that as much as eighty percent of change initiatives fail (Fisher, 1994; Beer and Nohria, 2000; Higgs and Rowland, 2000; Hirschhorn, 2002; Knodel, 2004; Sirkin, Keenan & Jackson, 2005; Kotter, 2008; Whelan-Berry and Somerville, 2010). In light of this, several frameworks have been constructed in order to lead and implement change in organizations. One of the most seminal frameworks is the model of change management constructed by Kotter (1995), which takes a practical approach to lead change. In this paper, Kotter introduces eight sequential steps, or phases, which an organization must undergo in order to transform successfully. Each step requiring a considerable amount of time and should be integrated and completed in an orderly fashion. These steps are as follows (Kotter, 1995):

1. Establishing a Sense of Urgency
2. Forming a Powerful Guiding Coalition
3. Creating a Vision
4. Communicating the Vision
5. Empowering Others to Act on the Vision
6. Planning for and Creating Short-Term Wins
7. Consolidating Improvements and Producing Still More Change
8. Institutionalizing New Approaches

The following segments highlight and explain each of the eight steps.

2.2.1 Establishing a Sense of Urgency

Analyzing an organization's *"[...] competitive situation, market position, technological trends, and financial performance"* is according to Kotter (1995, p. 60) a prerequisite in order to initiate a successful change effort. Kotter (1995) further claims that the findings of the analysis must be communicated broadly and dramatically, in order to create disruptions and a sense of haste in the organization, especially in regards emerging threats or potential crises. He claims that this first step is essential since organizational transformation requires determined cooperation between individuals. In his paper Kotter (1995) says that the most successful change efforts he has witnessed always begins with an individual or group who can facilitate a candid discussion about the unpleasant reality, or the potential unpleasant reality which might come. Understanding the need for change, be it due to bad business results or potential threats, is crucial so that the change mediators is given enough power to initiate the change initiative (Kotter, 1995). Kotter (1995) suggests using sources outside of the organization as a tack to reinforce the change mediator's agenda, like, for example, consultants. Armenakis, Harris & Mossholder (1993) and Gist et al. (1989) support this view, claiming that enlisting outside sources enhances the mediator's message and credibility, given that they agree with the message.

2.2.2 Forming a Powerful Guiding Coalition

Kotter (1996) explains that a guiding coalition consisting of the right individuals is critical to drive and lead a change initiative, a view supported by Cunningham & Kempling (2009). According to Kotter (1996), four key characteristics is essential for the individuals of the guiding coalition to inherit, characteristics which have some correlation with other studies in the organizational change literature (Caldwell, 2003; Lines, 2007; Paper, Rodger & Pendharkar, 2001). First, the coalition needs enough primary actors who are in positions of power and authority, so the opposition cannot block progress. Second is expertise. The coalition needs to be able to make intelligent decisions, meaning it needs a diversified composition so that all relevant viewpoints are represented. Thirdly, the coalition members should be respected by those in the organization so that decisions are not being questioned for the wrong reasons by the rest of the organization, in other words, the coalition must be credible. At last, the coalition

should have enough leaders to be able to drive the transformation process as successful transformations require leadership.

2.2.3 Creating a Vision

According to Kotter (1995, p. 63), it is vital that the guiding coalition establishes a vision, a picture of the future, that is *"[...] relatively easy to communicate and appeals to customers, stockholders and employees"*. By vision, one means something which goes beyond regular budgeting and planning and gives the organization a direction in which it needs to move. Kotter (1995) holds that without a vision the transformation initiative can decompose into a series of confusing and incompatible projects which rather than taking the organization forward can immobilize it or even take it in the wrong direction. As stated by Kotter (1996), a well defined and intelligent vision is fundamental in order to be able to look beyond short-term goals and challenge the status quo, extending the organizations thinking to longer-term issues. He further states that a well-defined vision is not only crucial for leadership and management purposes but also makes change process more understandable for the employees and simplifies their decision making. The significant value of having an unambiguous vision is well documented within the change management literature, researchers by and large agree that a clear vision is essential for the success of the change initiative (Flamholtz & Kurland, 2006; Whelan-Berry & Sommerville, 2010; Wright & Thomas, 1997).

2.2.4 Communicating the Vision

Researchers agree that communication is important in major organizational transformation processes as it can reduce uncertainty and confusion, as well as even affect the reception of the change initiative within the organization (Bordia et al., 2004; Frahm & Brown, 2007; Nelissen & van Selm, 2008). Kotter (1995) agrees and emphasizes the fact that the change process will never be successful without the involvement of the employees, or as he puts it: "*Without credible communication, and a lot of it, the hearts and minds of the troops are never captured"* (Kotter, 1995, p. 63). This statement is further supported by Frahm & Brown's (2007) research on communication and change receptivity, wherein they found that employees often felt

frustrated due to lack of involvement and information. Moreover, Smith, Sohal & D'Netto (1995) found that higher employee involvement in the change process and better communication, correlated well with successful change initiatives. Kotter (1995) emphasizes the importance of using all possible channels to communicate the vision, leaving no employee in the dark. Continuing with that repetition is key in order to get the message through.

2.2.5 Empowering Others to Act on the Vision

Kotter (1995) argues that successfully communicating the new direction of the organization emboldens employees to develop new ideas and try new approaches. However, communication alone is rarely sufficient to drive transformation (Kotter, 1995). Often an employee clearly understands the vision and direction of the company and wants to push the organization forward. However, something or somebody is blocking the path (Kotter, 1995). Kotter (1995) discusses empowering others through the removal of barriers and addresses four major barriers: structures, skills, systems, and supervisors. Structures are linked to internal organizational structures, and whether these hinders change or undermine efforts for change. Skills are linked to the fact that change often requires the acquisition of new knowledge through learning and training (Kotter, 1995). Systems can, for example, be information systems, how information is gathered and put to use in order to improve the organization's processes (Kotter, 2002). Lastly, the one Kotter (1995) proclaims to be the worst one, supervisors or bosses who refuse to change. The same barriers can be recognized in other studies on employee empowerment as well (Cacioppe, 1998; Klidas et al., 2007; Paper, Rodger & Pendharkar, 2001).

2.2.6 Planning for and Creating Short-Term Wins

Researchers seem to agree with the notion that creating small short-term victories is essential in order to complete large scale transformation processes (Kotter, 1995; Marks, 2007; Pietersen, 2002; Reichers, Wanous & Austin, 1997). Kotter (1995) and Pietersen (2002) both state that without short-term goals the renewal process risks losing momentum and that even small victories help to build confidence and a belief that longer-term and more important goals are within reach. In other words, short-term victories confirm that the change initiative is indeed

paying off (Kotter, 1995). However, Kotter (1995) emphasizes the difference between creating short-term wins and hoping for short-term wins, wherein the former is active, and the latter is passive. He exclaims that managers of successful transformation processes are actively on the lookout for performance improvements, targets achieved, establishing aims, and value creation.

2.2.7 Consolidating Improvements and Producing Still More Change

According to Kotter (1995), a major pitfall is the temptation of declaring victory too early. Managers have a tendency to prematurely profess change initiatives as successful and completed at the first sign of performance improvements or after the first major project has been completed (Kotter, 1995). He claims that leaders of successful efforts instead use the momentum awarded by short-term wins to tackle even more prominent problems, going after systems and structures which has yet to be confronted and which is not in line with the new transformation vision (Kotter, 1995). Momentum in this setting is linked to the enthusiasm and motivation to move the process forward, a factor which researchers agrees upon being important (Coleman, 1998; Kotter, 1995; Dick, 1995). Kotter (1995) further emphasizes that change initiatives are time-consuming processes and is only completed when the change has sunk deeply into the organization's culture and that the process must keep on steaming even after the first signs of positive change.

2.2.8 Institutionalizing New Approaches

As earlier mentioned, Kotter (1995) claims that change is only complete when it has sunk deep into the organization's culture and has become *"the way we do things around here"* (Kotter, 1995, p. 67). If not, the changes will degenerate as soon as the pressure and feeling of urgency are elevated. Kotter (1995) underlines two factors as particularly important when institutionalizing change in organizational culture. The first being demonstrating or showing the employees that the new way of thinking works and how it has helped improve organizational performance. Put differently, Kotter (1995) wants the employees to see that bigger picture and prevent them from making untrue connections as to why organizational performance has improved. While the second factor revolves around assuring that the next generation of top

managers embodies the new way of thinking and reflects the new approach in the best way possible. Wherein Kotter (1995) exemplifies this by saying that renewal will not last if the requirements for promotion does not change. He claims that poor successive decisions will be made unless the board of directors is an integral part of the transformation process.

2.2.9 Limitations of Kotter's eight-step model

Kotter (1995) argues that in order for the framework to be as successful as possible, the steps must be followed sequentially, with as little overlapping as possible. Thereby, claiming that the steps are dependent on each other and that consequently not starting from the beginning will make it problematic or even impossible to implement the following steps. However, due to this, Kotter's model has received some criticism. Herrero (2006) claims that the model is too sequential and therefore fails to account for that, in reality, most developments and events take place in parallel. As an illustration Herrero (2006) states that the model would work if one could establish a sense of urgency while at the same time creating a guiding coalition, and simultaneously developing a vision, communicating, empowering, creating small-victories and institutionalizing the new way of thinking in one parallel.

Furthermore, Appelbaum et al. (2012) argue that not all transformations require nor can undergo all steps. Appelbaum et al. (2012) use the change in manufacturing equipment in a factory as an example. Where in such a case, the change often is irreversible and permanent, consequently making both steps seven and eight trivial. Appelbaum et al. (2012) with support from Dopson, Fitzgerald, & Ferlie (2008) and Graetz & Smith (2010) holds that the usage of the framework is contingent on the scope of the change process and that the model must be adapted to contextual variables to work optimally.

2.2.10 Summary

In essence, this chapter introduced and discussed Kotter's (1995) eight-step framework for successfully implementing change. The eight steps are the following:

1. Establishing a Sense of Urgency
2. Forming a Powerful Guiding Coalition
3. Creating a Vision
4. Communicating the Vision
5. Empowering Others to Act on the Vision
6. Planning for and Creating Short-Term Wins
7. Consolidating Improvements and Producing Still More Change
8. Institutionalizing New Approaches

It was also established that the model has its limitations in regard to being too sequential (Herrero, 2006) and that not all changes necessarily requires all steps (Appelbaum et al., 2012). However, researcher's hold that the model must be adapted to the contextual variables to work optimally (Appelbaum et al., 2012; Dopson, Fitzgerald & Ferlie, 2008; Graetz & Smith, 2010).

3. Methodology

The primary objective of the methodology is to create a plan of action or a strategy regarding how to best perform the research in order to answer the problem formulation at hand. This chapter describes and justifies this strategy in detail and describes how the knowledge of this thesis was gathered and analyzed systematically. Ethical challenges and the measures which have been taken to ensure the quality of the research is also discussed.

3.1 Ontological and Epistemological Position

The researcher's ontological and epistemological standpoint is heavily influenced by constructivism and interpretivism. According to Johannessen, Christoffersen & Tufte (2011), ontology describes various beliefs about reality. Research is often influenced by what the researchers believe truth is and is therefore essential to discuss. The researchers of the thesis at hand believe in multiple subjective realities where truth is created by meanings and experiences and is bound to different contexts, a so-called constructionism ontological viewpoint (Crotty, 1998). This ontological position leads to the epistemological view named interpretivism, wherein epistemology is the assumptions researchers make about the nature of knowledge and how it is acquired (Richards, 2003). In this particular thesis, the researchers regard knowledge as personal, subjective, and unique. Therefore, in order to understand and develop new knowledge from someone's experience and the context which shaped it, one would have to dig deep through personal interactions. With these views in mind, the researchers considered themselves and the participants as co-creators of the findings and the knowledge created in this thesis.

3.2 Research Design

The research design of this thesis is the case study. In which the chosen design was based on the problem formulation: *what are the organizational consequences of industrial data sharing?*

Over the past decades, there has been an ongoing discussion on whether the case study brings any scientific value or not. As an example, Campbell and Stanley (1966) expressed that they did not see the value of the case study and have previously stated that *"[...] such studies have such total absence of control as to be of almost no scientific value ... Any appearance of absolute knowledge, or intrinsic knowledge about singular isolated objects, is found to be illusory upon analysis"* (Campbell and Stanley, 1966, p. 6-7). However, in his later research Campbell acknowledged that the case study does provide value and stated that sometimes it was the only route to knowledge, even though it could be noisy, fallible and biased (Campbell, 1975). Hans Eysenck is another example of a researcher who also altered his views about the value of case studies (Flyvbjerg, 2006). He initially believed that case studies only were a method of producing anecdotes, but later realized that *"[...] sometimes we simply have to keep our eyes open and look carefully at individual cases--not in the hope of proving anything, but rather in hope of learning something"* (Hans Eysenck, 1976, p. 9). In addition to Eysenck, Charles Ragin & Howard Becker (1992) expressed the same in their explorations of what the case study was and could be in social science (Flyvbjerg, 2006).

Robert K. Yin, which, today is one of the most prominent researchers of the case study (Johannessen, Christoffersen & Tufte), explains that that *"[...] the distinctive need for case studies arises out of the desire to understand complex social phenomena"* (Yin, 1989, p. 14). While Schramm (1971, p. 6) states that the essence of a case study *"[...] is that it tries to illuminate a decision or set of decisions; why they were taken; how they were implemented; and with what results"*. Both of these statements reflect the aims of this thesis.

There are several ways of conducting a case study. This thesis uses a single-case design, with a single unit of analysis. According to Yin (2017), this is when the researchers obtain information from one specific unit, which may be either an individual, a program, an institution, an event or a concept, within one defined system. In the thesis at hand, the single unit of analysis is the concept of data sharing between Aker BP and Framo, while the defined system is the oil

and gas industry. Industrial data sharing is not a widely common phenomenon within the oil & gas industry and is a phenomenon in its early infancy. Consequently, making it impossible to investigate several cases at this point, which likely would have increased the scientific value. However, as mentioned earlier, it is sometimes necessary to look at individual cases in order to learn and acquire new knowledge, which would not be feasible otherwise in this situation.

3.3 Research Method

After having chosen the case study as a suitable research design, the research method was next in line to be decided upon. Comparatively, with the research design, the research method is also highly dependent upon the chosen problem formulation. Since the problem formulation of this thesis is of descriptive and exploratory nature, the qualitative research method was found suitable. According to Johannessen, Christoffersen & Tufte (2011), the qualitative research method is appropriate if the investigated phenomenon is unknown for both the researchers and for the rest of the research community, and the researchers want a more in-depth and comprehensive understanding of the phenomenon. Both of the researchers had little to no prior knowledge about industrial data sharing in the oil & gas industry, and few to none related studies were identified in the literature search. Therefore, the qualitative research method proved valuable in answering the problem formulation. However, it is essential to recognize that there are some weaknesses associated with qualitative research. These are often linked to the incorrect interpretation of the data collected (Kerlinger, 1986), repeatability, and generalizability (Lee, 1989). These limitations will be further discussed in chapter 3.6 Research Quality.

As there were also only a handful of actors knowledgeable about industrial data sharing within the respective organizations, it was therefore deemed as reasonable to focus intensely on those actors, requiring a qualitative research method.

The ontological and epistemological views also influence the choice of research method. As mentioned earlier when discussing the researchers ontological and epistemological position, it was established that knowledge is personal, subjective and unique and that in order to discover it one had to dig deep, which is what the qualitative research method allows for and is suited for (Jacobsen, 2005).

3.4 Data Collection

This thesis collected its empirical data through the usage of semi-structured interviews. In this chapter, the strategy for how the data were collected and tools which were used will be discussed. The process and the choices made before and during the collection of empirical data will further be described as well.

3.4.1 Interview

Kvale et al. (2009) define the qualitative interview as a conversation with structure and purpose. The structure is related to the fact that each participant has a defined role; the interviewer asks questions, and the interviewee follows up with answers, and the purpose is often to understand or describe a particular topic. Saldana (2011, p. 32) describes the interview as *"[...] an effective way of soliciting and documenting, in their own words, an individual's or group's perspectives, feelings, opinions, values, attitudes, and beliefs about their personal experience and social world"*. The qualitative interview allows the participants to provide rich, contextual descriptions of events and gives them greater freedom to express themselves, compared to, a structured survey. Furthermore, human experiences and perception are often best described when the informants can influence the directions of the conversation (Johannessen, Christoffersen & Tufte, 2011; Byrne, 2001).

The research topic, purpose, and questions form the basis for the question formulations and the subjects to cover during the interview. In this thesis, a semi-structured interview method was used. The main reason for this is that it brings a good balance between standardization and flexibility (Johannessen, Christoffersen & Tufte, 2011; Hofisi et al., 2014). Standardization enables the researchers to compare data from different interviews more reliably and effectively, while flexibility allows for improvised conversation that may generate unexpected areas and insights for further inquiry (Saldana, 2011). The semi-structured interview is based on an interview protocol, which will later be described in 3.4.3.

It is important to note that the main limitation of the interview is that the data collected will likely be influenced by both the interviewer and the context of the interview, making it noteworthy to recognize that the interviewers themselves become part of the context of the interview and its results (Hofisi, Hofisi & Mago, 2014; Sapsford & Jupp, 2006). This is vital to be aware of in order to achieve as objective results as possible, both when conducting the interview and when analyzing the results.

A more specific limitation to the interviews conducted in this thesis is that the interviewees struggled with separating between the digital transformation of the organizations as a whole and industrial data sharing. This because industrial data sharing is an underlying and narrow part of the overarching digital transformation project. Therefore, during the interviews, the researchers always had to be specific in regard to differentiating between the consequences of the entirety of the digital transformation and industrial data sharing.

All the interviews were conducted over Skype due to the researchers and the participant's localization and the researcher's limitation of time and funding. According to King and Horrocks (2010, p. 84), *"qualitative researchers should be cautious about the use of remote video for interviews"* mainly because of technical glitches in sound and video transmission. However, the quality of these types of technologies has drastically improved since 2010. On the contrary, participants interviewed over Skype are often less worried about time because they are interviewed from home and in a comfortable environment (Iacono, Symonds & Brown, 2016).

Initially, it is necessary to mention that the interviews were audiotaped. This because audiotaping frees up the researchers to focus on the research interview instead of taking notes. Moreover, hastily taken notes, from the interview or memory, may not be as reliable and accurate as transcribed audio. Additionally, it increases transparency and accountability by having a record of who said what. The decision for only audiotaping, and not videotaping was based upon the notion that perceiving nonverbal cues and communication would be hard with the use of remote video. Besides, it was also not guaranteed that every participant would have access to a web camera.

3.4.2 Sampling

There are three fundamental principles when it comes to participant sampling in qualitative research, namely: sampling strategy, recruitment, and sampling size (Johannessen, Christoffersen & Tufte, 2011).

The participants were sampled by first finding a few suitable candidates through the researcher's contact person in Aker BP, and after that, the snowball or chain sampling method was used (Patton, 1990). The purpose of qualitative research is to establish and discover in-depth knowledge about the case at hand. It is, therefore, common to use sampling strategies to select informants (Johannessen, Christoffersen & Tufte, 2011). Hence, the participants are selected based on pre-selected criterions developed from the research questions, which in this case were knowledge about the data sharing happening between Aker BP and Framo. Only a handful of the workforce in Aker BP, Framo and Cognite worked with and was knowledgeable about this topic. Therefore, the most natural and most effective sampling strategy was to identify and interview a few suitable participants at the beginning of the sampling process. At the end of each interview, the question: *Do you know someone that is knowledgeable about this topic and would be willing to be interviewed*, was asked. The goal was that this would lead to information-rich participants to further interview. Snowball or chain sampling, which is used in this thesis, is a sampling strategy which suitable when the sample for the study is limited to a small subgroup of the population (Patton, 1990), which is the case for the thesis at hand.

A negative consequence of this sampling strategy is that it relinquishes a considerable amount of control over the sampling phase to the informants (Noy, 2008). For example, the informants could only give up the identities of people they knew would talk in one manner. This was solved by making the informants give up the identities of the persons to whom they referred instead of contacting them directly, so a background check could be carried out before accepting the new informants.

Since the contact information of new informants already was obtained through previous interviews, newly accepted informants were contacted and recruited by mail. Referencing to the person that referred them increased both the credibility of the researchers, as well as the credibility of the thesis, increasing the likelihood of them becoming informants.
Once the sampling strategy and the recruitment process had been determined, the sampling size was next on the list. Here, the idea of saturation was used to identify when to stop gathering information. Saturation is reached when *"[...] all questions have been thoroughly explored in detail, and no new concepts or themes emerge in subsequent interviews"* (Trotter 2012, p. 399; Seidman 1998; Kvale et al., 2009). The researchers contacted the total of fifteen suitable informants, and out of those fifteen, eight was willing and had the time to be interviewed. Towards the end, the researchers felt that saturation was somewhat reached. However, the researchers would have preferred to conduct at least a couple of more interviews, especially with employees from Framo, but finding suitable informants that had the time to be interviewed was challenging. The main reason for this was that most of the suitable informants had positions of high importance in their respective organization; having busy schedules with little to no time to spare.

It is noteworthy to mention that even though the researchers only conducted one interview with Framo, the informants from both Aker BP and Cognite were capable of reflecting over their situation due to the closeness of their relationship. Especially were Cognite capable of reflecting over Framo's situation, as they have been a third-party mediator between the two organizations and have extensively assisted Framo during the entirety of the process. In addition to this, the communication with the informant from Framo was continuous throughout the entirety of the thesis, answering new questions and verifying statements from the two other organizations. The same can be said for the researcher's primary contact person in Aker BP.

Name	Length	Organization
A1	55 minutes	Aker BP
A2	60 minutes	Aker BP
A3	40 minutes	Aker BP
A4	60 minutes	Aker BP
A5	45 minutes	Aker BP
c1	45 minutes	Cognite
C2	50 minutes	Cognite
F1	140 minutes	Framo
Total	**495 minutes**	**Across 3 organizations**

Table 1 - Interview Sample

3.4.3 Interview Protocol

Patton (1990, p. 111) describes the interview protocol as *"[...] lists of questions or issues that are to be explored in the course of an interview"*. For this thesis, three separate interview protocols were made, this because Aker BP, Framo, and Cognite all have different roles and perspectives. It was essential to capture these differences, and that meant asking different questions and touching on different topics for each of the organizations. The fundamental thing these interview protocols had in common was that all of the questions were based on the problem formulation, and the theory presented in chapter two. Most of the questions included were descriptive. These questions are often more comfortable for the informants to give a clear answer to compared to those of relational nature. Relational questions were therefore avoided, and instead answered by the researchers is the analysis, which Patton (1990) recommends.

The primary function of the interview protocol was for it to work as a rough travel itinerary for both the interviewer and the interviewee. It did not precisely specify what would happen, but it did establish a clear sense of the direction of the interview. Additionally, it forced the researchers to think about how to plan and structure the interview to make the best out of the limited time available.

3.5 Analysis

In order to make the recorded interview data easily accessible and processable, it had to be analyzed and interpreted. This process was done by using Creswell's (2009) model of data analysis. Figure 3 shows the four steps in which the data analysis was conducted. The procedure of the steps is explained in detail below.

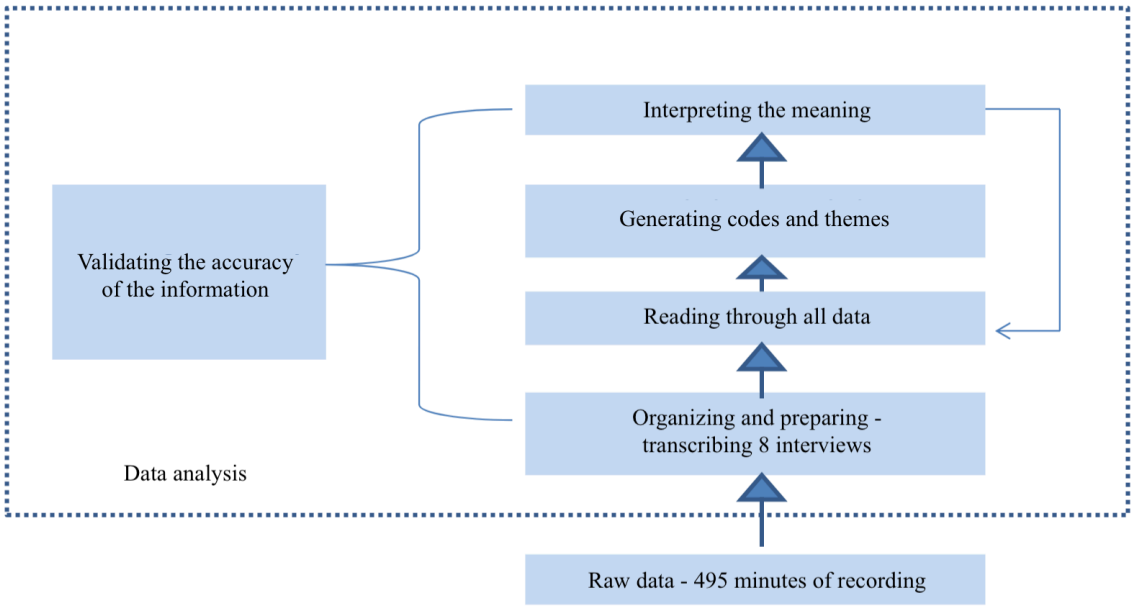

Figure 3 - Data analysis process

The initial step in the displayed model is organizing, preparing, and transcribing the recorded interview data. Preferably, data should be documented as precisely and thoroughly as possible. However, this is easier said than done. When transcribing one changes the information medium from a verbal expression to written expression, and in this process, make way for issues in regard to interpretation. Kvale et al. (2009) express that when transcribing from verbal to written one often tends to lose the narrative, thus transcribed information often can seem incoherent and decontextualized. This owing to that one loses the pace, the intonation, the breaks, the hesitations and the so on and so forth when transforming verbal expressions to written expressions. Since the entirety of analysis of this thesis was solely built upon the transcripts of the interviews, the decision regarding the level of detail when transcribing was of high importance and needed to be determined initially in the data reduction process (Miles & Hubermann, 1994). In this thesis, the recorded interviews were transcribed word-for-word and

in the native language of the interviewees, hereunder Norwegian. It, therefore, needs to be noted that the direct citations were translated from Norwegian to English and that in order to keep the content of the citations as close to the original as possible, sentence structure and grammar had to be altered. Nonlinguistic observations, such as facial expressions and intonations, were not included to avoid researcher biases and misinterpretations. Additionally, the transcriptions were made right after each interview to minimize the risk of misunderstandings and misinterpretations (Askheim & Grenness, 2008).

In step two, the transcribed data was thoroughly read to obtain a general sense of the information and to reflect on its overall meaning. Findings that could be linked to the research questions were highlighted and later combined. These notes were later used in creating the emergent codes later in the process.

The third step displayed in the model is coding the transcribed data. According to Gibbs (2007) coding, *"[...] is a way of indexing or categorizing the text in order to establish a framework of thematic ideas about it"*. Babbie (2007) states that this is a significant step for further reducing, organizing, and interpreting the transcribed data and that there are several methods for doing so. For the researchers of this thesis, creating or adopting meaningful code names were of importance. The codes used derived from previous literature, the researcher's knowledge, the interviews, or a mix of all three. The coding procedure included both predetermined codes, which were the themes of the interview and emergent codes developed from the interviews and transcription process. The researchers used a computer-assisted qualitative data analysis software named NVivo (NVivio, 2019) to manage, organize, and code the collected data easily.

In the fourth and final step, the data were interpreted. The goal of this step was to make sense of the coded data and to do this; the researchers asked themselves critical questions in regard to lessons learned and induced a discussion. The lessons consisted of both personal interpretations and meanings derived from the comparison of the findings with information deducted from the earlier reviewed literature and theories. Making comparisons with earlier reviewed literature enabled the researchers to suggest that the findings confirmed or diverged from past findings and to suggest new questions that needed to be asked (Creswell, 2009). Furthermore, in chapter 3.4.1, it was mentioned that it was difficult for the interviewees to differentiate between the consequences of the overarching digital transformation of the organizations and industrial data sharing, which were also the case for the researchers when

analyzing the results. The researcher was aware of this and tried to their best ability to differentiate between when the informants discussed the consequences of the digital transformation as a whole and industrial data sharing.

3.6 Research Quality

Lincoln & Guba (1985) posit that trustworthiness of a qualitative research study is vital to evaluate its worth and that this involves establishing credibility, transferability, dependability, and confirmability. To ensure the trustworthiness of this thesis, a discussion about all of the four criteria is in the following subchapters.

3.5.1 Credibility

To increase the credibility of this thesis, the researchers decided to use member checks and triangulations of sources. Lincoln & Guba (1985) states that credibility is the confidence in the "truth" of the findings and that ensuring credibility is one of the most critical factors in establishing trustworthiness. Credibility essentially asks the researchers to link the findings of the research study to reality in order to demonstrate its authenticity. To establish a clear link, the researchers of this thesis had a strong emphasis on member checks. Data collected and the tentative interpretations of these data were taken back to the participants from whom they derived which allowed them to check whether the data was correct, and the interpretations made were plausible, and thereby reducing the chances of what Kerlinger (1986) refers to as incorrect interpretations. In addition to member checks, triangulation of sources was used, which involved utilizing different data sources. Triangulation assumes that if two or more sources of data converge on the same conclusion, then the conclusion is more credible (Tracy, 2010). Meaning that if informants from all of the three organizations had the same perception of the situation, it would leave it more credible than if only one informant made the statement.

3.5.2 Transferability

Transferability refers to the degree to which findings have applicability in other contexts or settings and is what Lee (1989) refers to as generalizability. It is therefore of high importance for researchers to disclose the boundaries of the study to the reader. Due to this, thick descriptions were made. Thick description involves describing a phenomenon in sufficient detail so the reader can begin to assess to what degree the conclusions made are transferable to other contexts or settings (Lincoln & Guba, 1985). This description can be found in the introduction of the thesis.

3.5.3 Confirmability

Confirmability can, according to Lincoln & Guba (1985), be described as the degree of neutrality of the findings. In other words, to what degree are the finding shaped by the informants and not the interests, motivations, or the biases of the researchers. The most common technique used to establish confirmability is the audit trail (Lincoln & Guba, 1985), which is a tool used in this thesis. An audit trail transparently details the process of data collection, data analysis, and interpretations of the data, which were done earlier in this chapter. The audit trail helps to ensure that the findings of this thesis were supported by the data collected and not figments of the researcher's imagination. Literature and findings in other studies that confirmed the researcher's interpretations were used to ensure this even further. Another important aspect of confirmability is reflexibility. Tjora (2017) describes reflexivity as the researchers own ability and determination in examining their own research and how personal interests and prior knowledge might have influenced the research process. Reflexibility was also something the researchers had in mind throughout the entire research process. Being multiple researchers, in this case, two, and having access to a supervisor led to the development of complementary as well as divergent understandings of the various situations. As a result, the researcher's different beliefs, assumptions, perspectives, and values were revealed and contested.

3.5.4 Dependability

In the previous chapter, it was established that an audit trail was used to strengthen the confirmability of the thesis, a tool that can also be used to make the thesis more dependable. Lincoln & Guba (1985) describes dependability as the degree of research consistency and repeatability. Even though an audit trail can help increase the degree of dependability, Lincoln & Guba (1985) argues that external audits where researchers not involved in the research process reviews both the process and its findings as necessary. Due to the limited timeframe of this thesis, a complete external audit was not feasible. However, both the university supervisor and some fellow research colleagues read through and consulted the researchers in order to uncover any inconsistencies in the conducted research.

3.7 Ethics

Ethics is often described as a set of principles, rules, and guidelines for evaluating what is right and what is wrong, and these rules naturally apply for scientific researchers as they do for the rest of society (Johannessen, Christoffersen & Tufte, 2011). Kvale et al. (2009) mention four areas of particular importance when it comes to ethics in research, namely: informed consent, confidentiality, consequences, and the researcher's role.

Informed consent is reached when informants have an understanding of the purpose and procedures of the thesis, that their participation is entirely voluntary and that he or she can withdraw at any stage of the process (Johannessen, Christoffersen & Tufte, 2011; Kvale et al., 2009). To ensure informed consent, the researchers sent out an email describing the thesis, how data would be processed, and the voluntary nature of participation to the informants.

Confidentiality of the information given by the participants and the anonymity of respondents had to be respected. Kvale et al. (2009) state that an essential question for the researchers to consider is: *what information should be available for whom?* During this thesis, the data collected was only available for the researchers, and audiotapes were quickly transcribed, anonymized, and stripped for sensitive information. Information that could potentially reveal the identity of informants, like name or position, were not included. Instead, the informants

were named A1, A2, C1, F1, etc. using the capital letter of their respective organization, ensuring complete anonymity while also preserving the connection between the different statements made by the same informant.

The third ethical area that Kvale et al. (2009) mentions are consequences, which relates to both advantages and disadvantages the informant can encounter after participation. Since none of the statements made by the informants could be traced back their identities, the researchers assessed that the chances for any consequences, good or bad, were low. However, the contact information of the researchers was given to each informant, just in case any of the informants in hindsight felt that their answers could lead to any consequences. This way, statements of concern could be removed or redacted.

The fourth and final ethical area Kvale et al. (2009) mention is the researchers own role in regard to his action and his beliefs, and how this can influence the research. In qualitative research, it is especially important for researchers to consider their behavior in interview situations since different behaviors can influence the interview object in different ways, which were discussed earlier in chapter 3.4.1. Overall, the researches of this thesis acted independently and with no specific goal in mind other than being as objective as possible.

To be allowed to store personal data; in this case, the audio files from the interviews, the thesis was approved by NSD, Norsk senter for forskningsdata, before the data collection started. The approved report was sent and explained to each participant and asked to sign before the interviews began. The full report can be found in Appendix 1.

4. Empirical Results

In this part of the thesis, the empirical findings are presented. This chapter is structured according to the research questions which were introduced in chapter 1.2, Research Aim and Problem Statement:

1. For what reasons do the stakeholders share industrial data?
2. Which organizational changes have the stakeholders conducted in order to share and receive data, and how did they implement them?
3. How do the stakeholders perceive changes in inter-organizational relations in the ecosystem due to industrial data sharing?

4.1 Reasons for Sharing

One of the main aims of this thesis is to explore the drivers behind the decision of sharing industrial data. In order to properly understand the organizational consequences of industrial data sharing, the underlying reasons why some organizations decide to share their data must be understood. Significant changes are usually motivated by something. In this section, the empirical results which describe these motives are presented, as well as which value the stakeholders believe data sharing unlock and opportunities it brings.

4.1.1 Time of Crisis

As noted in the introduction, the oil price dropped dramatically in 2014 and hit bottom in early January 2016 before it started to slowly rise again. The interviewed informants of Aker BP explained that the organization by no means were prepared for this drop and that they realized that their current business model was inadequately equipped to respond to oil price fluctuations and not profitable in a low-price setting. The informants all referred to this realization as a spark or ignition for change. Due to this, Aker BP went outside of the organization looking for new

ways to improve and adapt their way of doing business. An informant from Aker BP explained: *"What we realized was that organizations which were good at digitalization and effectively utilizing their data was doing well in other markets."* - A2

This led to a reevaluation of the organization's strategic foundation. Consequently, changing its perception of the ecosystem in which it operates and the organization's data utilization. The keyword here being data utilization. The informants explained that Aker BP as an organization changed its perception of data and how data could be used as a resource. One Aker BP informant explained that there are two ways to create value in Aker BP, one can either produce a more significant quantum of barrels or produce the same amount but at a lower cost. Meaning that the most logical steps to maximize value were to optimize asset uptime and production. The informants from Aker BP further explained that Aker BP realized that they as an organization did not inherit the competence or knowledge to optimize equipment uptime, or effectively troubleshoot faulty equipment during shutdowns. However, what they did possess was data displaying what lead to the shutdown in the first place, or data which in the right hands could optimize equipment performance. The informants from Aker BP explained that they saw two possible ways of acquiring this competence and knowledge, either internally within the company or externally through the ecosystem. They also made it clear that they as an organization were not interested in becoming experts at supplier equipment but rather desired to be experts at oil exploration and production. This led to the notion that the performance data should be shared with the equipment supplier, who in the eyes of the informants at Aker BP was the expert on the equipment and had a better chance of successfully analyzing the data. A notion which the Aker BP informants explained to be a drastic change, as Aker BP had historically not been willing to share any of its asset's performance data with anyone. As summarized by an Aker BP informant:

> *We realized that it is of great value to share our data with other parties which are better and smarter than us at utilizing it in new and innovative ways. To build and improve algorithms demand domain competence, which our equipment manufacturers have. We acknowledged that we possessed vast amounts of data which we did not or even could not take full advantage of.* - A1

In essence, the main takeaway from this chapter is that the industrial data sharing change initiative set root in a time of crisis. The informants from Aker BP explained that they realized that organizations which were good at digitalization and effectively utilizing their data was doing well in other markets. After this, they acknowledged that they, as an organization did not have the competence or knowledge to utilize their own equipment's performance data. They, therefore, concluded that it was of great value to share this data with other parties who were better and smarter than them at utilizing it, to fully take advantage of it.

4.1.2 Motive

One of the main motives for sharing industrial data is cost reduction related to asset maintenance, replacements, and optimization. One of the informants from Aker BP explained that there are very high costs linked to offshore repairs, especially if there is a production shutdown involved. Offshore maintenance frequently involves sending both personnel and equipment offshore, as well as thorough planning ahead of the operation. In order to prevent production shutdown, Aker BP currently practices calendar governed maintenance on most of its offshore equipment, which means that maintenance is performed in cycles no matter the equipment's condition. A norm Aker BP wishes to step away from through the strategic usage of data, according to the informants.

As mentioned, the operator has traditionally been responsible for the equipment's condition during operation, sharing little to none of the performance data of the equipment with its supplier. This means that the supplier in the past had minimal knowledge about how the equipment they manufactured behaved during day-to-day operation. The informant from Framo explained that the few times they got insight into how the equipment functioned during standard operation was when something typically had gone wrong. As explained by the Framo informant:

> *The scenarios where we received data was when something typically had gone wrong. If we were lucky, the operators would hand over a few pictures of graphs before they would ask why a pump performed in a certain way. One time we were asked to diagnose a water injection pumps performance for a client, and we were asked to perform a root cause analysis for why it behaved this way. During this work, we received an excel spreadsheet, with four measurements taken daily for the month preceding the failure. For some states, you need a measurement to be taken just when the system is acting up to be able to diagnose it, and this was one of those cases. I hope it is not too much of a spoiler to say that those readings did not reveal any abnormal state. That would have been too convenient.* - F1

As mentioned earlier, Framo has traditionally conducted maintenance and replacements on their delivered equipment in calendar-based cycles, which often have led to significant maintenance and service costs for the operators. Both parties expressed the belief that by letting the equipment supplier carefully monitor the equipment's performance data, these maintenance and replacement intervals could be extended, and equipment breakdowns could, to a greater degree, be prevented. Furthermore, by making equipment data more accessible to the supplier, Framo could monitor the performance of their delivered equipment. Enabling them to create models for predictive and later prescriptive maintenance, swhich they are currently working on. With this in mind, Aker BP and Framo created their first performance-based pilot contract, namely the SMART-contract.

According to the informants, instead of getting paid by their product or conducting maintenance on the product, Framo now gets paid based on the performance and uptime of the equipment. In this new contract, Framo receives incentives to perform well and to optimize their pumps, both operation and design wise. Which now is made possible through the reception of equipment's performance data. This access, according to Framo, gives them a more in-depth understanding of how the pumps can be tweaked in order to increase productivity and longevity, which in turn increases profit for both parties.

> *Framo delivered a seawater pump that is actively pumping water on the Ivar Aasen platform. For the first time, Framo has full access to all of their equipment's performance data in real time and have the possibility to monitor the operations of the products they delivered, which is entirely new within the industry. Previously Framo delivered a piece of equipment, handing us all the responsibility of the operations. Today, they deliver a service, meaning that it is their responsibility that the pump works. This shift gives them new and unique knowledge about their products and gives them a whole new sense of ownership of the products.* – A4

An informant from Framo also explained that:

> *In the past, we had sporadic and minimal access to operational data. Without that data, we had little information on how the pumps were operated on a day-to-day basis other than when we occasionally had personnel onboard. Therefore, as a general rule, we had to assume that our customers operated the pumps in a manner consistent with our manual for operation, followed our recommendations for maintenance and operated at a point close to the point they defined in the specifications during the procurement stage.* - F1

As a result of sharing equipment performance data, Aker BP hopes to reduce the total operational equipment costs, mainly in terms of less offshore maintenance. However, offshore maintenance is by and large one of the biggest sources of revenue for the supplier and by removing that removes a significant portion of the supplier's cash flow. The informants from Aker BP and Framo hope that performance-based contracts will be able to replace this revenue by enabling Framo to design and develop improved products and services in the future projects, reducing the amount of maintenance needed and lowering maintenance costs.

> *We want less maintenance on our installations equipment due to machine learning and predictive maintenance, meaning less service personnel offshore. Implicitly, this will impact the supplier's revenue. Earnings which they are today dependant upon, and what should they be given as compensation? What can we give them which they can profit from? That is what we are doing by giving them access to all performance data, which will enable them to sell the output of their products as a service and be compensated for the uptime on the equipment rather than paying for calendar-based maintenance. - A3*

The informants from Aker BP emphasizes that it is data sharing, which facilitates these new opportunities in regard to the way they do business with each other. More specifically facilitating for performance-based contracts, total reduced cost, and a higher degree of innovation. Therefore, the stakeholders perceived purpose for sharing industrial data is to develop diagnostic capability and to identify further improvements on its equipment packages for future and existing projects. As explained by an Aker BP informant: "*Now we see that sharing data enables our suppliers to produce even better solutions, services, and products*" - A3.

In short, one of the main motives for sharing industrial data is cost reduction related to asset maintenance, replacements, and optimization. Especially Aker BP wants to reduce the usage of calendar governed maintenance, which they believe is doable through the strategic usage of data. The results reveal that traditionally, Aker BP has been withholding performance data, giving Framo little to no insight into how the equipment was operated and its performance on a day-to-day basis. With the introduction of the SMART-contract and through the sharing of performance data Aker BP and Framo hopes to reduce their costs as this incentivizes Framo to optimize their products and service and to develop diagnostic capabilities.

4.1.3 Summary

The empirical results in regard to the first research question: *For what reasons do the stakeholders share industrial data*, identified cost reduction related to asset maintenance, replacements, and optimization as the main drivers. The informants from Aker BP stated that they did not have the competence or knowledge to utilize their data to develop diagnostic capabilities on equipment and optimize equipment operation on their own. However, they realized that the supplier of the equipment, in this case, Framo, possessed this competence and knowledge. With access to more data, the supplier could improve their already existing products and deliver new and better products and services, benefiting both Aker BP and Framo. Since Framo could monitor and optimize their equipment on a day-to-day basis, a performance-based contract was created between the two parties, shifting the responsibility of the equipment's performance and uptime over from Aker BP to Framo.

4.2 Organizational Changes

This chapter sheds light on the organizational changes which were conducted by the stakeholders in order to successfully share, receive, and extract value from the data, as well as the implementation of these changes, hereunder identifying obstacles and success factors. When talking to the informants, three particular areas were mentioned as essential for successfully conducting a digital transformation. Namely, vision and leadership, data liberation, and people and orchestration. Where vision and leadership seem to be a common denominator, while data liberation seems to be mostly linked to the data sharer, and people and orchestration seem to be mostly linked to the data receiver. Due to their particular empirical importance, the chapter is separated accordingly.

4.2.1 Vision and Leadership

The informants from Aker BP explained that their vision is to digitize every operation from cradle-to-grave. Consequently, increasing productivity, ensuring better quality, streamlining processes, reducing environmental impact, and increasing employee safety. The informants from Aker BP further explained that they believed that this aim is only achievable through the strategic use of data. Hereunder, making data accessible not only internally within Aker BP but also sharing it externally with other organizations in the value chain. The informants from Aker BP explained that this led to the need for a shift in the organizations and industries mindset, which traditionally has been conservative. The Aker BP informants explained that this change of mindset has been a radical one and that having an unambiguous vision of their aim has been critical for the success of the transformation so far.

The informants from Framo explained that their vision is to be the preferred pump supplier and ensure that the reliability of their pumps is only equaled by the reliability of Framo as a partner, believing that strategic use of data would help them achieve this vision of becoming the preferred pump supplier. The informants from all three organizations emphasized the importance of the management, external consultant's and Cognite's role in the transformation effort, especially as communicators of the vision and mediators of the implementation. Furthermore, the informants communicated that it always has been crystal clear where the organizations are heading and how they intend to get there.

> *We have an apparent and unquestionable management, and this is a prerequisite in order to succeed. It is hard implementing something if the management does not have ownership over it. It takes plenty of muscles to make people understand and change. The vision must be anchored throughout the organization from top to bottom and repeated over and over. We are not only communicating this vision internally but also externally.* - A2

The informants from all of the three organizations pointed to Aker BPs Chief Executive Officer as especially important for the success of the change initiative so far. He was described as a visionary person with high technical competency, able to talk both to the board and press in a simple, high-level fashion. While also being able to talk extremely detailed and technical when

necessary, being the case for several other key actors in the top management as well. Throughout the industry, the Chief Executive Officer of Aker BP is additionally known for being one of the biggest advocates of the idea of industrial data sharing, one of the Aker BP informants explained. Him being visionary, enthusiastic, public, and crystal clear when communicating the organization's vision was stressed by the informants as vital for the change initiative so far. An Aker BP informant stated the following when discussing the Aker BP Chief Executive Officer: *"At conferences, our CEO runs around with his t-shirt promoting data sharing, when he actually should have worn a suit and tie."* - A2

The informants expressed that another critical factor for the success of the change initiative is the way Aker BP has been promoting their vision externally. The informant from Framo stated that they traditionally have been conservative in their mindset and that deciding to collaborate with Aker BP on something like this was a radical change for them. Both the Aker BP and Framo informants explained that having aligned goals and visions in regard to industrial data sharing has been imperative for the success of the change initiative. In addition to emphasizing the importance of developing these together.

The quote from one of the Cognite informants below summarizes this subsection perfectly:

> *Change starts at the top with a vision and strong leadership. Look at the CEO of Aker BP. If it is not communicated that this is important, that this is what we are doing, and that this is the path we are taking, then the organization will never follow.* - C1

Lastly, one informant from Aker BP explained that the change initiative took longer than expected, but also stated that change initiatives like this never really ends. Furthermore, the informant emphasized that managers need to be able to continuously set new aims and goals in order to keep the wheel turning. The same informant also criticized themselves saying that during the change effort there has been to much focus on it only being a pilot further down in the organization, and not something which would at some point be implemented throughout the entire organization. Claiming that some employees did not feel any ownership over the change initiative and therefore, perhaps was too indifferent about the project. Something which perhaps better communication could have solved.

Reflecting over these empirical results, aligned goals and visions anchored in the top management have been imperative for the change initiative thus far. It is also evident that Aker BP's external communication of their goals and aims of the change initiatives, as well as continually renewing these in order to create still more change, has been of high importance.

4.2.2 Data Liberation

When Aker BP first started looking into the idea of sharing their data with other organizations, their first realization was that much of their data was inaccessible, locked away in various systems and silos. Making it cumbersome to do anything useful with it and to share. The informants explained that in order to facilitate the sharing of data between organizations, Aker BP first had to get control of their data. As explained by an Aker BP informant: *"We saw that our current setup did not enable us to share data effectively and simply – it was hampered with too many silos and data lacking contextualization."* - A1

To get control of their data, Aker BP went looking for potential partners that could help them do so. However, their search was in vain as they could not find any suitable partners which matched their criteria. A second option the Aker BP informants explained was to create a solution internally within the organization. Earlier it was mentioned that Aker BP wanted to become the best oil exploration and production company, not information technology company or supplier equipment expert, therefore removing this option.

The solution ended up being the birth of Cognite. The informants explained that Cognite's main task was to develop an industrial data platform in order to make data more accessible, insightful, and open. Not only for Aker BP but for the entire industry. Cognite was supposed to be an independent entity, and by doing so, Aker BP enabled Cognite to have other customers as well, even competitors of Aker BP, which in turn would enable Cognite to make better products and services. The Cognite data platform connects all of Aker BPs data sources, gathering them in one system, allowing them to efficiently and effectively access and share their data with anyone they prefer through the platform. Therefore, anyone can connect themselves to the data platform and start making applications and solutions based on the data, as long as Aker BP grants them access. Just like Framo is doing with applications for optimizing their equipment.

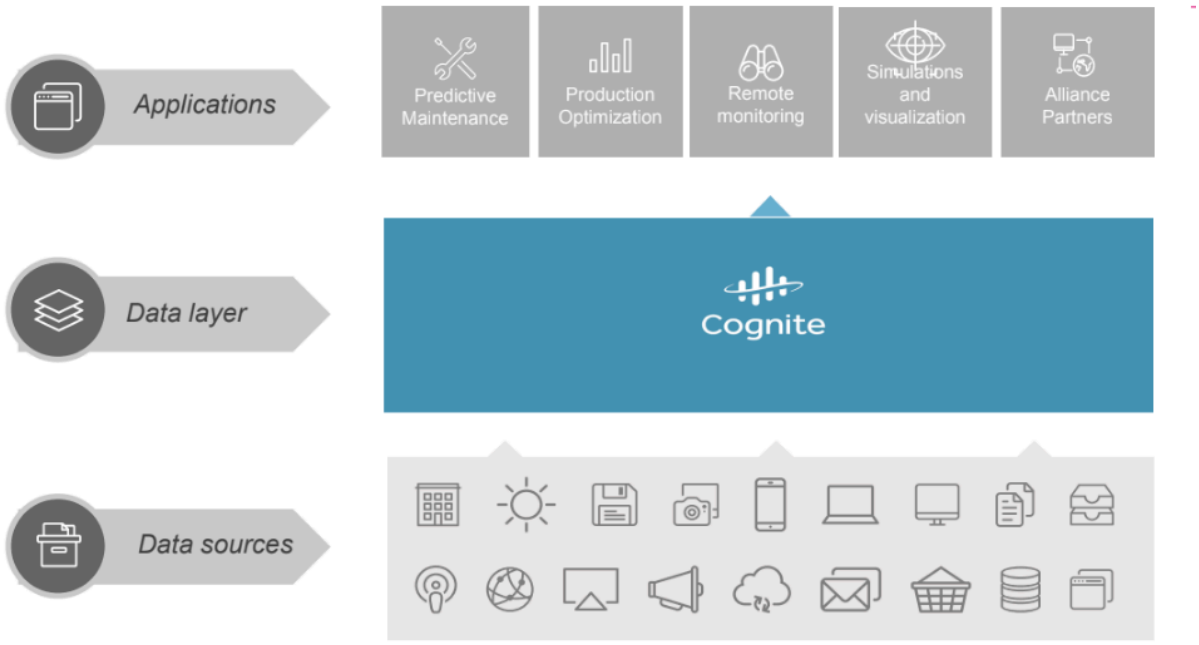

Figure 4 - Data Liberation. Photo: Aker BP

The illustration on the previous page shows Cognite's role in gathering Aker BPs various data sources into a data layer, which in layman's term makes it available within a browser for third-party integration—in this case, Framo.

4.2.3 People and Orchestration

By liberating and making data more accessible one do indeed unlock a great deal of possibilities, one informant from Cognite explained. However, making data more accessible does not help if the employees of the organization are unable to utilize it. Often employees have a predefined understanding of how some problems are solved, or even if some problems are solvable or not, which means that even in a situation where the employees suddenly have access to all historical and live data they still follow the same old procedures and work patterns. An important finding which all of the informants talked about in some regard is the finding that after being granted access to data, the receiving organizations must change old habits and practices in order to put it to use, they must work data driven. A Cognite informant explained it like this: *"Having access to both live and historical data opens up lot of possibilities, but it does not help one bit if the employees are not capable of taking advantage of it"* - C1

When asked to explain what working data-driven means and how organizations must change in order to work data-driven, the informants separated it into two different categories: decision making and work methodology. In regard to decision making, the informants explained that more often than not decisions, be it technical or organizational, were made based on someone's experience or intuition and not on some objective reality. One informant from Cognite explained a situation where they followed an equipment maintenance employee around an oil rig and the employee would lay his hands on the machinery and feel its vibrations and heat, and listen to the sound it made in order to decide whether it needed a check-up or not. This particular employee had been working on the same machinery over many years, knowing it inside out. *"However, what happens when knowledgeable employees like this disappear or make mistakes?"* (C2) one Cognite informant asked rhetorically. This example is just one out of many wherein decisions are made based upon gut feeling. By mapping this knowledge and applying it to data, one can make objective and better decisions in the future, the Cognite informant explained.

> *What we are seeing is that a lot of decisions are being based on a combination of experience and gut feelings. We mean that data is a digital representation of physical objects, containing extreme amounts of information which is impossible to figure out only based on beliefs, experiences, etc. Having access to both historical and live data makes it possible to create a complete digital representation reflecting reality, enabling organizations to make decisions based on objective truths instead of subjective meanings.* - C2

In regard to work methodology informants from Aker BP and Framo explained that they are very focused on working with use cases, always focusing on trying to solve a problem. The informants from Cognite claimed that working use case based is the best and fastest way to extract value from data and implementing digital transformations like the case at hand. Wherein they emphasized the importance of building infrastructures incrementally and having a strategy for how one wishes to unlock value, not trying to solve every problem at once. Thereby aiming for the lower hanging fruits. One informant from Cognite expressed that *"too many organizations just want to jump immediately to the top, but that just fails time after time"* - C1

Several of the informants agreed that the work methodology had to shift to towards the likes of traditional software companies. Hereunder agile development and scrum were used as examples. Another critical point which was emphasized by all parties was the introduction of a fail-fast culture. By making data more accessible one reduces the cost linked to failing, which enables one to inexpensively test new applications and solutions, accelerating innovation.

> *We very much believe in working use case based. We believe that trying to build a giant infrastructure which has every possible application is pointless. We build stuff incrementally and what we build is set to solve something which provides value, and to do just that one's got to build little by little. That is the software way of doing things. - C1*

A Cognite informant explained that in order to implement these new habits and practices of making data-driven decisions and working more like traditional software companies, the organizations must acquire competence within information technology, and combine it with traditional engineering competence. At the time this thesis was conducted, Framo was in the process of appropriating this competence through new hires and by teaching the existing employees how to work with data. The Cognite informant further emphasized the importance of using outside coaching to teach the engineers how to leave their traditional ways of working for the benefit of the new methodologies — stating that *"using agile coaches helps the engineers to work in new ways. Work methodology is a cultural thing, and one has to change one's mentality to be able to work differently" - C1.*

In retrospect, the main takeaways from this subchapter are that organizations must work more data-driven in order to take advantage of the shared data and to drive the change initiative. Data receivers need to start making decisions based on data instead of a subjective gut feeling. Furthermore, changes regarding work methodology are arguably interlinked with both extracting value from data, as well as driving the change initiative. Working use-case based and having a fail fast culture is not only the most effective way of extracting value from data but also an effective way of implementing digital transformations like the case at hand.

4.2.4 Summary

In essence the empirical results from the second research question: *"Which organizational changes have the stakeholders conducted in order to share and receive data, and how did they implement them?"* points to two main organizational changes that the stakeholders believed were necessary. Hereunder, data liberation, and people and orchestration. Data liberation is what first and foremost enabled Aker BP to share their data and put it to use. Data sharing would nearly be impossible without first gaining control over the data. Secondly, people and orchestration were perhaps regarded as the most challenging aspect of the change initiative. Here the term working data-driven were introduced. Working data-driven was separated into two cubicles, namely decision making and work methodology. The first involved making objective and better decisions based on data, while the latter about work methodology to innovate and create new solutions and applications based on the data, as well as driving the change initiative forward.

In order to implement these changes, the informants stated that at having aligned goals and visions has been critical to guide the change initiative. Furthermore, management's role as communicators of the visions and goals also seemed to be of great importance, and especially the role of the Chief Executive Officer as an inspirer and change mediator.

4.3 Relations

The third and final research question seeks to illuminate how industrial data sharing is changing inter-organizational relations. This chapter describes the empirical findings found in accordance with this research question, having the relationship between Aker BP and Framo as a basis.

4.3.1 Relational Changes

The informants from all parties expressed that the relationship between Aker BP and Framo had gradually changed since the start of the data sharing pilot. Before the project started, the relationship was good, however mostly transactional based, wherein Aker BP bought a piece of equipment from Framo and Framo conducted a couple of follow up services on the equipment. One of the Aker BP informants had this to say about their relationship with Framo before the data sharing pilot:

> *I believe that our relationship with Framo was pretty standard in buying equipment and aftermarket services in a traditional manner as did fit our old operating model. They delivered new pumps to our oil fields if they won the tender.* - A1

Interestingly all the informants agreed that throughout the pilot, the inter-organizational relationship shifted towards increased relational exchanges and collaboration. On a higher level, the two organizations have aligned their goals and visions in order to direct the change initiative better. An Aker BP informant expressed this about the turn their relationship has taken:

> *Now it is a very intimate and long-term partnership, where we are working closely together to improve not only ourselves but them as well. We may even appear together at exhibitions, on presentations, and in the media.* - A1

This is what the Framo informant expressed about the change in Aker BP and Framo's relationship:

> *The main difference is that now as a part of the Aker BP's digitalization project, we are seated at Aker BP, working directly with the people whom we previously only communicated with through email and phone calls. Overall, we are indeed working a lot closer and effectively in realizing concrete deliverables rather than high-level aspirations expressed in status meetings. As such, we are better aligned and certainly better coordinated in our work with developing tools which can help Aker BP and us make better-informed decisions supported by data.* - F1

However, the empirical results point to that even though Aker BP and Framo work closer together on an organizational and project level, the same does not necessarily apply on a day to day basis. The informant from Framo explained that increased access to data empowers them to work more independently from Aker BP. Project engineers now do not have to the same extent to contact their counterparts in Aker BP to ask for help and information; the information is just there. Thereby reducing communication between the organizations on a day to day basis. However, this being said, the results point to that they now collaborate increasingly on more significant overarching problems, since data sharing removes a lot of the need for communication. The informant from Framo stated the following:

> *Data sharing has enabled our project engineers to a greater extent being able to work independently of their Aker BP counterparts, meaning that they are to a larger degree able to find out of things by themselves and not having to ask for help. This results in quicker turnaround times, lower costs on both sides and should lead to a better customer experience.* - F1

The introduction of industrial data sharing and the shift towards collaboration was not meant to be a win situation for only one party, but rather a situation which both mutually benefited from the informants explained. Informants from Aker BP explained that they realized that by helping Framo develop better products and services, they would also be helping themselves, something which is being incentivized through the performance-based contract and data sharing. An Aker BP informant had this to say on the matter:

> *We needed to ensure that this contract did not end up as a zero-sum game. We wanted both parties to benefit mutually from the contract. We were, therefore, working closely together, establishing a common strategy and key performance indexes that provide a common goal for both parties. - A3*

Another aspect mentioned by the Aker BP informants was that data sharing and digitalization affected their evaluation process when it came to partner up with new organizations. The informants clearly expressed that it was important that in order to collaborate, both organizations needed to have the same views and prioritization when it came to digitalization and data utilization.

> *One of our criteria for choosing new partners is their ambitions for digitalization. We are taking into account what resources they are sitting on and what their plans are to keep up with the digital journey we are on.* - A2

4.3.2 Summary

The empirical findings from the third research question: *"How do the stakeholders perceive changes in inter-organizational relations in the ecosystem due to industrial data sharing?"* indicates that the inter-organizational relationship between Aker BP and Framo have shifted towards increased collaboration and mutualism. However, the results also show that this necessarily is not the case on a day to day basis wherein increased access to data removes a lot of the day to day communication. The evaluations criteria for choosing new partners have also been affected, in which the willingness and capabilities of keeping up with their digital journey have become an important criterion.

4.4 Organizational Consequences

As stated in the introduction, the overall aim of this thesis is to answer the following problem formulation: *What are the organizational consequences of industrial data sharing?* In this section, the overarching problem formulation is answered empirically.

In the empirical findings from the first research question, the informants from Aker BP stated that the organization did not have the competence or knowledge to utilize the vast amounts of data they possessed to develop diagnostic capabilities on equipment and optimize equipment operation on their own. However, they realized that the equipment supplier, in this case, Framo, possessed this competence and knowledge. Increased access to data enables the supplier to improve their already existing products and, to deliver new and improved products and services, benefiting both Aker BP and Framo. Since Framo now could monitor and optimize their delivered equipment on a day to day basis, a performance-based contract was created between the two parties, shifting the responsibility of the equipment's uptime over from Aker BP to Framo.

The empirical results from the second research question show several organizational consequences as a result of the change initiative. First of all, the informants pointed to the importance of data liberation for the data sharer, meaning getting control of the data and making it accessible internally and for strategic third parties. For data receivers, the term working data-driven arose. Working data-driven were mainly defined within two different categories, namely data-driven decision making and data-driven work methodology. The first involved making objective and better decisions based on data, while the latter about work methodology to innovate and create new solutions and applications based on the data. Additionally, work methodology was linked to successfully driving the change initiative forward. Lastly, all of the informants pointed to the importance of their respective organization's vision and management in order to get everyone aboard and act in accordance with the new change initiative. Which consequently affects the respective organization's direction.

For the third research question, the empirical findings were that industrial data sharing not only affected the stakeholder's organizations individually but also the inter-organizational relationship between them. Shifting from a traditional transactional relationship over to a relationship focused on increased collaboration and mutualism. However, the empirical results also show that this necessarily is not the case on a day to day basis wherein increased access to data removes the need for a lot of the day to day communication.

Based on these empirical findings, one can conclude that there are several organizational consequences of industrial data sharing. The biggest driver for industrial data sharing was Aker BP's realization that they did not inherit the knowledge and competence to fully utilize their equipment's performance data, and therefore had to acquire it elsewhere. This led to them starting to share the performance data of their equipment with the equipment supplier who did inherit the right competence and knowledge — as a result, changing their strategic focus which initially was a significant organizational consequence. Data sharing further facilitated the implementation of a performance-based contract between Aker BP and Framo, which shifted the responsibility for the equipment's uptime from the operator to the supplier. Where the supplier got incentivized for the equipment's performance and uptime and not by the product and follow up maintenance. In order to successfully share their data, Aker BP first had to get control over it. Consequently, liberating it through the Cognite Data Platform. For data receivers, in this case Framo, the term working data-driven arose. This term was primarly

devided into two different categories, herunder, data-driven decision making and data-driven work methodology. Work methodology was also linked to driving the change initative forward. Data sharing also lead to changes in the relationship between the two, shifting from a more traditional buyer-seller relationship towards the likes of a relationship focused on increased collaboration and mutualism. However, the need for a lot of the day-to-day communication became decreasingly important.

Furthermore, it is important to discuss the empirical conclusion in the context of previous research and theory in order to better understand the organizational consequences of industrial data sharing. The overlying theoretical perspectives of this thesis is within the schools of strategic management and change management, therefore the questions: *how does the consequential shift in strategic focus cope in the context of strategic management?* and *how can the change initiative be better understood?* naturally arises. These questions are discussed and answered in the next chapter.

5. Discussion

The empirical results in chapter 4.4 indicated that there are several organizational consequences of industrial data sharing and the questions: *how does the consequential shift in strategic focus cope in the context of strategic management?* and, *how can the change initiative be better understood?* arose. In this chapter, the empirical results are discussed and interpreted in the context of previous research and theory, to answer the two questions mentioned above. With this in mind, the empirical results are going to be illuminated using two different schools of theory, namely strategic management and change management.

First, the empirical results are looked upon through the lens of strategic management. Here the results are first put into the context of information theory, more precisely the DIKW-hierarchy and data-driven decision making, to establish the prerequisites required to extract value from data, and how these are linked to and between the stakeholder's organizations. This establishes a basis for understanding why the stakeholder's organization share their data. After that, the empirical results are discussed using two different perspectives within the strategic management literature, hereunder conventional strategic management, and the industrial network perspective.

Thereafter, the empirical results are discussed using Kotter's change management framework (1995). This framework is used as means for debate in order to get a better comprehension of the change process, which followed the introduction of industrial data sharing. In this paper, Kotter (1995) introduces eight sequential steps which an organization must undergo to successfully change. All of these steps are discussed thoroughly in the context of the case at hand in this chapter.

5.1 Strategic Management

As concluded empirically, one of the biggest drivers for industrial data sharing was Aker BP's realization that they did not inherit the knowledge and competence to take full advantage of their equipment's performance data. The empirical results pointed to that Aker BP saw two possible ways of acquiring this competence, either internally within the company or externally through the ecosystem. Aker BP decided to go for the latter, and thereby broadening their strategic perspective to the entirety of the ecosystem, which initially was a sizeable organizational consequence. This further facilitated the implementation of a performance-based contract between Aker BP and Framo shifting the responsibility for the equipment's uptime and performance from the operator to the supplier. This chapter discusses these results in light of previous theory and research, to answer the question: *how does the consequential shift in strategic focus cope in the context of strategic management?* Beginning with framing the decision within the context of information theory. After that the results is discussed in the context of two contrasting perspectives within the strategic management literature, to better understand the case at hand.

5.1.1 Information Theory

The empirical results indicate that Aker BP indeed does possess vast amounts of data. However, previous studies have concluded that data on its own creates minimal value unless it is structured into a specific context and utilized, in other words, transformed into information, knowledge, and wisdom (Chaffey & Wood, 2005; Rowley, 2007). Data can, therefore, be regarded as the fundamental building block for the rest of the DIKW-hierarchy (Ackoff, 1989; Chaffey & Wood, 2005). The informants from Cognite described data as a digital representation of a physical object. What Cognite then describes as data is what Chaffey & Wood (2005) describes as information since it is already organized and structured in such a way that it brings relevance for a specific context or purpose. By comparing the DIKW-hierarchy with Cognite's definition, one can argue that Aker BP's information can be used to create knowledge and later wisdom about a specific physical object. Thereby unlocking a better understanding of the physical object, giving a better foundation for decision making (Blackwell, 1953; Brynjolfsson, Hitt & Kim, 2011).

There is little to no sense in gathering and contextualizing data if the information gained is never interpreted and applied in real life decisions. In other words, knowing how to draw sensible conclusions out of information and the wisdom to take actions based on it. To illustrate, let us say that Aker BP receives the sensor value 110 from one of its equipment. This value could represent anything and does not become information until it is given a context, for example, 110 °C. Knowledge is knowing that the equipment should not be operating at values greater than 100 °C. While wisdom is taking measures, so the value decreases to a more optimal range in order to prevent equipment casualty. It is therefore evident that data and information create little value on its own, and that this value increases when combined with expert opinions, skills, and experience (Chaffey & Wood, 2005) — ascending further up in the hierarchy.

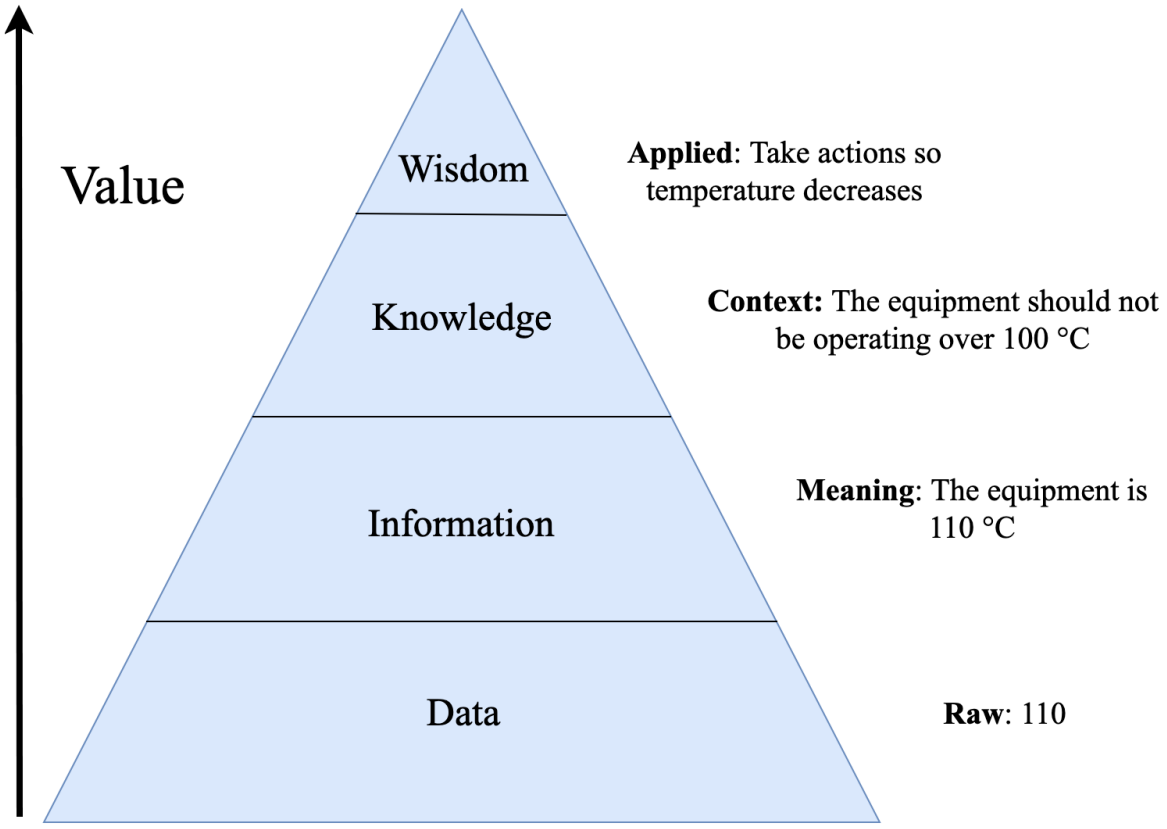

Figure 5 - DIKW Hierarchy with Example

It is interesting to note that according to the informations, Aker BP realized that they lacked the competence or know-how to turn information about their third-party equipment to valuable insight and later value-creating actions. Arguing that the ones inheriting this were the equipment suppliers, which is logical when considering that they are the ones who designed and made the equipment. A conclusion which is in accordance with Chaffey & Wood (2005), who states that knowledge is data and information combined with expert opinion, skills, and experience, resulting in a valuable asset which is beneficial for decision makers. With the DIKW-hierarchy as a basis, it is evident that Aker BP possesses the data and information about the equipment, while Framo possesses the competence to turn it into knowledge and, later, wisdom. Enabling them to unlock new dimensions of the data's value together, using the Cognite Data Platform. Galbraith (1973) further argues that organizations which performs complex tasks, which unquestionably Aker BP and Framo does, should be oriented towards effective information processing and streamlining information flow within their organizations. Thereby improving performance and lowering costs. This is undeniably the case between Aker BP and Framo when they combine Aker BP's data and information with Framo's expert opinion, skills, and experience. Galbraith (1973) argumentation only entails one organization; however, the empirical results imply that this might also apply for inter-organizational cooperation as well.

Both Blackwell (1953) and Galbraith (1973) argued that more copious amounts of information increases expected reward when dealing with decision making including uncertainty, stating that improved information always improves performance. It became evident from the empirical results that shutdowns resulting from equipment malfunction was detrimental, and therefore excessive maintenance on equipment was conducted in order to avoid this. Yet Aker BP has been withholding information about the physical equipment even though Framo has been the ones making decisions in regard to when maintenance is to be conducted and giving consultation when something is not running as it should be. This induced a situation where Framo made decisions and gave consultation based on little to no information, which, according to Blackwell (1953) and Galbraith (1973) is very unbeneficial in complex and uncertain situations.

The two most common strategies to handle task uncertainty and the need for increased information are: developing buffers that reduce the effect of uncertainty or reducing uncertainty with increased information flow (Galbraith, 1973; Premkumar, Ramamurthy & Saunders, 2005). Since Framo had limited access to information about how their equipment performed, it forced them to follow the first strategy. Adding buffers to their calendar-based service schedule, performing them more regularly than needed to counter the uncertainty. Consequently, increasing maintenance cost and personnel exposure to danger. With Aker BP now sharing its data with Framo, it enables them to slowly reduce the uncertainty by increasing the information flow. This is in line with the second strategy of transferring the data from the point of origin directly to where the decision rest. Hereunder, Aker BP's offshore equipment to Framo's competente employees. Allowing them to perform less maintenance without negatively influencing the equipment's performance.

In essence, it was established through the usage of the DIKW-hierarchy that by combing Aker BP's data and information with Framo's competence to create knowledge and wisdom builds a better understanding of the physical equipment. Which consequently establishes a better foundation for decision making, leading to better performance (Blackwell, 1953; Galbraith, 1973). The increase of information flow allowed Framo to reduce uncertainty around its equipment, instead of compensating with maintenance buffers.

5.1.2 Conventional Strategic Management

In chapter 5.1.1, it was established that Aker BP and Framo possessed separate parts of the DIKW-hierarchy. Here Aker BP possessed the two bottom building blocks of the hierarchy, namely, data and information, while Framo possessed the competence to turn it into knowledge and later wisdom. Established research within the field of information theory claims that all steps are required in order to best extract value from data, implying that Aker BP must acquire the last two in order to maximize value output of their data (Chaffey & Wood, 2000; Rowley, 2007). The empirical results show that instead of climbing the last two steps themselves, Aker BP decided to redefine their strategy and instead share their data with Framo who already did inherit the right knowledge and wisdom — achieving the last two steps through them. This new

strategy then raises the question: *how does the stakeholder's new strategy cope in the context of conventional strategic management?*

As earlier mentioned, the fundamental underlying question in the strategic management literature has been *how can an organization achieve and sustain competitive advantage over other organizations?* (Rumelt, Schendel, & Teece, 1994). With great emphasis on the words *over other organizations*. While Grant (1998) argues that conventional strategic management has been solemnly about winning since its birth. The fundamental ideology of the field has been that all other organizations in the ecosystem are threats and that organizations should gain independence from them, and power over them (Porter, 1980). Moreover, the conventional strategic management literature argues that an organization should not share its resources with other organizations, as resources are regarded as the basis for sustained competitive advantage (Andrews, 1971; Barney, 1991; Thompson & Strickland, 1990; Petraf, 1993). Both of these fundamental notions are in great contrast with the empirical results of this thesis.

Historically, Aker BP has not been willing to share its data with anyone, which indicates that they previously have been following the traditional ideology in regard to supplier relationships and resources. However, this has now changed with the introduction of industrial data sharing. Instead of regarding its suppliers as potential threats like Porter (1980) suggests, Aker BP instead views Framo as a strategic partner capable of unlocking great value for both of them through data sharing and cooperation. The introduction of the performance-based contract makes Aker BP increasingly dependant upon Framo, as the equipment uptime responsibility now lays with them. This also equalizes Aker BP's bargaining power over Framo, as the performance-based contract makes them mutually dependent upon each other (Keith et al., 2016). Which is contradictory to Porter's (1980) strive for independence and increased power over suppliers.

Neither the competitive forces school or the resource-based perspective takes cooperation and sharing into consideration. Interestingly Wernerfelt (1984) argues that organizations should aim to control resources which are attractive to other actors in the market like performance data is attractive to Framo. However, by controlling Wernerfelt (1984) means making it harder for other organizations to acquire these resources, and thereby giving the organization a competitive advantage. Barney (1991) holds that internal resources must be best utilized relative to external opportunities to gain a competitive advantage. However, this is not the case

with data. Data and information hold very little value for organizations without the competence to turn it into knowledge and wisdom (Chaffey & Wood, 2005; Rowley, 2007), which is by and large the case for Aker BP. This collides with Barney's (1991) principles of how resources are capable of creating a competitive advantage, something which, according to his framework data is not capable of. However, both Aker BP and Framo claim that by enabling Framo to make better products and services through data sharing, Aker BP also wins in the form of the lower maintenance cost and process optimization. Thereby increasing both Aker BP's and Framo's organizational performance. Which is the opposite of what the resource-based view claims would happen in this context.

Based on this, there are reasons to believe that conventional strategic management does not suffice in the context of industrial data sharing. This because the fundamental ideology and logic behind the conventional strategy is a polarization to the fundamental principles of industrial data sharing. Conventional strategic management is too focused on competitive advantage over others, ignoring dimensions of value creation through collaboration and sharing.

5.1.3 Collaboration in Industrial Networks

It was previously established that conventional strategic management does not suffice in the context of industrial data sharing due to diverging underlying ideologies. This raises the question: *will then a strategic perspective which acknowledges cooperative and relational dimensions between organizations be more suited in the context of industrial data sharing?* In contrast to the conventional strategic management's view of competitive advantage over others discussed in the previous subchapter, there is the industrial network perspective (Håkansson & Snehota, 1989). The industrial network perspective shifts the strategic focus from the organization and its allocation and appropriation of internal resources, to focus on the way organizations relates to the ecosystem and its resources (Baraldi et al., 2007; Gadde, Huemer & Håkansson, 2003; Håkansson & Snehota, 1989). This perspective is based on the idea that no organization is complete, and therefore not in control of all the competence and resources it needs in order to operate (Ford, 2011).

In chapter 5.1.1 it was asserted that Aker BP only possessed what the DIKW-hierarchy defined as data and information, but lacked the expert opinions, skills and experiences to turn it into knowledge, and later wisdom to unlock their data's full potential. According to the empirical results, Aker BP also acknowledged this. Meaning that they acknowledged that they as an organization did not inherit all the competence and resources they needed in order to extract their data's value. This is in line with Ford's (2011) statement that no organization is complete and that its success dependants upon its suppliers. The empirical findings point to two ways of appropriating the required competence and expert opinion. Hereunder, developing it within the organization or acquiring it externally through cooperation. The informants from Aker BP made it clear that they as an organization were not interested in becoming experts at supplier equipment but rather desired to be experts at oil exploration and production, which means that it was unwanted to appropriate this competence themselves. Consequently, Aker BP, therefore, turned to the ecosystem in which they operate to fill their shortcomings. Gadde, Huemer & Håkansson (2003) with support from Håkansson & Snehota (1995) and Wilkinson & Young (2002) asserts that resources have concealed and uncharted dimensions which potentially if unlocked, can increase organizational performance. Moreover, that these dimensions only can be utilized through relational development, which is Aker BP's strategy in regard to industrial data sharing.

The industrial network perspective also states that zero-sum contest types of relationships between organizations only leads to rivalry and conflict, and is therefore unbeneficial for both parties (Gadde, Huemer & Håkansson, 2003). The informants from Aker BP mentioned that one of their main goals were to reduce equipment maintenance, which in this case were a large portion of Framo's revenue. Meaning that reducing the amount of equipment maintenance while following the traditional approved provider model would increase Aker BP's revenue, while directly decreasing Framo's. Resulting in a zero-sum game. Something which is typical within the conventional strategic management literature (Porter, 1980), which implies that any inter-organizational relationship has a winning and a losing side, even relationships with suppliers who organizations more or less are dependent upon. Aker BP sharing their performance data facilitated the use of the performance-based model instead of the approved provider model. Increasing dependency, but also the potential to create value (Keith et al., 2016). Deviating the focus from the transaction of the equipment on itself over to value creation for both Aker BP and Framo through increased innovation and reduced cost, which is aligned with the differences Dwyer, Schurr & Oh (1987) states when transitioning from a more transactional relationship to

a more relational. Shifting from a zero-sum contest to a win-win situation, which Gadde, Huemer & Håkansson (2003) also argue for.

Similar to Ford's (2011) argumentation that no organization is complete, Gadde, Huemer & Håkansson (2003) hold that an organization's activities is dependant upon its supplier's activities and that coordination of activities between the different parties enhances the organization's performance. The empirical results of the case at hand further underline this, stating that the new business model reduces Aker BP's maintenance costs and increases equipment performance. Which is a result of Framo now being able to optimize their physical products, services, and processes due to new insights through the sharing of performance data, something that they can apply to all future projects. A consequence of inter-organizational collaboration and coordination of activities. The empirical results of this study underpin the industrial network perspectives ideology that by broadening one's strategic perspective to how the organization relates to its ecosystem and its resources enhances organizational performance (Gadde, Huemer & Håkansson, 2003; Håkansson & Snehota, 1995; Wilkinson & Young, 2002).

In essence, the industrial network perspective seems to be a well-suited framework in the context of industrial data sharing. This because the framework acknowledges that no organization is an island (Håkansson & Snehota, 1989), and is not in control of all the competence and resources it needs in order to achieve optimal performance (Ford, 2011; Gadde, Huemer & Håkansson, 2003). The perspective further emphasizes that resources have untapped value dimensions, which only can be exploited through relational development. Which also is largely the focal point of data sharing between Aker BP and Framo.

5.1.4 Strategic Consequence

In chapter 5.1, the question, *how does the consequential shift in strategic focus cope in the context of strategic management?* arose. This chapter summarizes the key takeaways from the previous subchapters to answer the question mentioned above.

By using the DIKW-hierarchy and the empirical results as tools for discussion it became evident that Aker BP indeed held vast amounts of both data and information, however, did not inherit the competence to unlock its value entirely. Due to lack of expert opinions, skills, and experience to interpret the data and information (Chaffey & Wood, 2005; Rowley, 2007). It was established that Aker BP could appropriate these attributes in order to create knowledge and wisdom in two ways, either by acquiring competence internally within the organization or through cooperation with suppliers. Aker BP decided to go for the latter, deciding to share equipment's performance data with its supplier Framo, hoping that it would help Framo create better solutions and products, which in turn benefits Aker BP. This new strategy was discussed in light of conventional strategic management literature where it was concluded that the perspective was ill-suited in the context of industrial data sharing. This because the fundamental ideology and logic behind the conventional strategy is a polarization to the fundamental principles of industrial data sharing and does not account for dimensions of inter-organizational resource sharing and cooperation.

After asserting that conventional strategic management was unsuitable in the context of industrial data sharing, the industrial network perspective was introduced. This perspective shifts the focus from competitive advantage over others to organizational performance and thereby acknowledging that no organization is complete on its own and that resources have concealed dimensions which only can be unlocked through relational development (Håkansson & Snehota, 1989; Gadde, Huemer & Håkansson, 2003). It became evident that the industrial network perspective was a good fit in the context of industrial data sharing. Meaning that organizations must broaden their strategic perspective from allocation and appropriation of internal resources, to instead focus on the ecosystem and the resources within, as well as how the organization relates to the ecosystem (Håkansson & Snehota, 1989). Organizations must realize that it does not inherit all the required competencies to optimize performance and is dependant upon its supplier's performance to operate satisfyingly (Ford, 2011). Meaning that

by making their suppliers better by sharing information and coordinating activities, they also make themselves better.

Then to answer the question, *how does the consequential shift in strategic focus cope in the context of strategic management?* stated at the beginning of this section, one can manifest that the new strategic focus of Aker BP and Framo does not cope well within the conventional strategic management literature. However, industrial data sharing does cope well within the framework of the industrial network perspective. This because the underlying ideologies of the conventional strategic management are in great contrast to the ideas of industrial data sharing, especially in regard to how the conventional strategic management views resources and other actors in the ecosystem. While the ideologies of the industrial network perspective coincide well with the ideologies of industrial data sharing. This became evident after using the DIKW-hierarchy as a basis for discussion on how one extracts value from data and after that discussing the empirical results in light of the two strategic perspectives.

5.2 Change Management

The empirical results tell that the introduction of industrial data sharing led to a substantial transformation process, for both Aker BP and Framo. Both of them expressed that having aligned goals and visions, and strong leadership has been essential to the success of the change initiative so far. It was apparent that the two organizations also faced different challenges, where the data sharers were mostly linked to data liberation and the data receivers were mostly linked to working data driven. This raises the question: *how can the change initiative be better understood?* To get a better apprehension of the transformation process, which was a direct organizational consequence of the industrial data sharing initiative, the empirical results are discussed using Kotter's (1995) eight-step framework. Here Kotter (1995) presents eight sequential steps organizations must undergo in order to implement the change initiative successfully. All of these steps are in this chapter discussed in light of the case at hand, and then summarized in chapter 5.2.9.

5.2.1 Urgency

The oil crisis in 2014 unquestionably affected the financial performance of the entire industry negatively, including Aker BP and Framo. Several of the informants pointed to this crisis as catalysator for uncertainty, which led to several change initiatives in the oil and gas industry. Most organizations realized that their current business model was inadequately equipped to respond to uncertain oil prices and not profitable enough in low-price settings. The low profitability resulted in several layoffs, which was given much attention in the media, further strengthening the uncertainty within the industry. Informants from Aker BP and Framo both explained that their organizations felt like the rest of the industry an urgency to change, and thereby blaming the 2014 oil crisis as one of the major catalysts for the industrial data sharing initiative. The results mentioned above match Kotter's (1995) first step, which argues that most change efforts set root in unpleasant realities and a time of crisis.

The informants from Aker BP explained that the crisis made them look at organizations doing well in other markets to see how they dealt with times of uncertainty. Their findings were that organizations efficiently utilizing their data was doing well in uncertain situations. Leading to a reevaluation of the organization's strategic foundation. Galbraith (1973) argue that effective information utilization improves performance, which is in line with Aker BP's findings. Kotter (1995) points to analyzing the situation, trends, and organization's performance as a prerequisite to successful change initiatives which gives one reason to believe that Aker BP's approach was the right way forward. More specifically, this led to the revaluation of Aker BP's data utilization, which further underlines Kotter (1995).

It is essential to point out that the crisis started externally, giving reasons to believe that this made it easier to initiate the change effort across organizations since most organizations felt the negative effect of the declining oil price. Giving power and credibility to initiate the required change program (Kotter, 1997). Which arguably was the case for Aker BP and Framo. The informants from Aker BP explained that the change initiative would not likely have taken place without an external crisis. One can, therefore, assume that the external crisis and the big blow up it got in the media enhanced the change mediator's credibility and agenda (Armenakis, Harris & Mossholder, 1993; Kotter, 1995; Gist et al. 1989).

5.2.2 Guiding Coalition

The informants from both Aker BP and Framo stated that the change initiative was from the beginning well anchored within the top management of their respective organizations. It became clear through the empirical findings that the management involved with the change initiative was not only competent in business and management but also technically. Top management's technical understanding was by the informants emphasized as a necessity, this because it made them capable of understanding the challenges ahead and thereby also capable of making intelligent decisions. In addition to the top management, external consultants, including employees from Cognite, were hired to help with the implementation. Interestingly one can assume that the top management from both organizations, the consultants and Cognite employees together formed an inter-organizational guiding coalition, which most likely was necessary in an inter-organizational change effort like the case at hand. Even though the guiding coalition was inter-organizational the findings in regards to their characteristics are in accordance with findings reported by other researchers (Caldwell, 2003; Kotter, 1995; Lines, 2007; Paper, Rodger & Pendharkar, 2001) who emphasized that a guiding coalition should consist of individuals representing multiple standpoints — enabling the coalition to make intelligent decisions.

Furthermore, Kotter (1995) argues that the coalition should consist of respected actors, and actors in position of authority which by and large the guiding coalition did since it consisted of top management from both organizations. Considering how the guiding coalition of this change initiative consists of representatives of both parties, and have thus far been successful, one could speculate that inter-organizational change efforts require inter-organizational guiding coalitions.

5.2.3 Vision

When asked about the change initiatives vision, all of the informants responded with the vision of their respective organizations. Aker BP's vision was and still is to digitize every operation from cradle-to-grave, while Framo's vision is to be the preferred pump supplier and ensure that the reliability of their pumps is only equaled by the reliability of Framo as a partner. Interestingly, it seems that the change initiative does not have a shared vision developed by the guiding coalition, which Kotter (1995) stresses as essential. However, informants from both parties claimed that the organization's vision and aims were somewhat aligned and that they both had common goals which they formed together. Meaning that perhaps having a shared vision created by the guiding coalition is not as crucial for inter-organizational change initiatives like this, and that common goals and aligned visions might be sufficient. Appelbaum et al. (2012) claim that not all change initiatives need to undergo all steps, which is somewhat similar to these findings. However, most research points to that having a clear vision as critical for change initiatives (Flamholtz & Kurland, 2006; Kotter, 1995; Whelan-Berry & Sommerville, 2010; Wright & Thomas, 1997). Wherein Kotter (1995) claims explicitly that without a clear vision, organizations will often be too focused on short-term goals, and be unable to implement the change and challenge the status quo fully. Something that can neither be proved or disproved in this thesis, due to that the organizations have not yet fully implemented the change. Most research within the change management field has been conducted on organizational change efforts and not inter-organizational, meaning that the same findings might not apply in both cases.

5.2.4 Communicating the Vision

In the previous subchapter, it was established that the change initiative did not have its own vision developed by the guiding coalition. However, both of the organizations had their own vision, which was somewhat aligned. The empirical results show that the organization's vision was in most cases well communicated within the individual organizations, as well as the reason why the change initiative started. This to remove uncertainty regarding the change initiative, and to make sure the employees of the organization's acted in accordance to the aims of the organization, in which previous studies agree (Bordia et al., 2004; Frahm & Brown, 2007;

Kotter, 1995; Nelissen & van Selm, 2008). Informants from Aker BP, Framo and Cognite also referred to Aker BP's external communication of their vision, and the aims of the change initiative as extremely important. Especially they pointed to the Chief Executive Officer of Aker BP, as an essential mediator of the change initiative influencing not only the employees of Aker BP but also Framo. This ties well with Kotter's (1995) fourth step, in which he states that communication is vital in major organizational transformation processes and that repetition of the vision was essential to leave no employe in the dark.

One could speculate that being as public about the change initiative as Aker BP has been a smart decision, as data sharing is dependent upon having a data receiver which utilizes it, creating value for both parties. Kotter (1995) emphasizes the importance of using all possible channels to communicate the vision, which is in line with Aker BP approach of not only communicating the vision internally but also externally.

One informant from Aker BP criticized themselves for not extensively communicating through the organization that the pilot, was not only a pilot but something which would be applied to the entire organization at some point. Saying that due to this, some employees felt indifferent to the change initiative. This indifference is somewhat in line with Frahm & Brown's (2007) findings that lack of information and involvement could lead to frustration, which gives one reason to speculate that indifference is a consequence of frustration for not being involved. However, there are too little empirical findings on the subject to conclude anything. Smith, Sohal & D'Netto (1995) hold that higher employee involvement in the change process, and greater communication increases the positive reception of the change initiative. Something which correlates well with the Aker BP informant's thoughts on the matter.

5.2.5 Removal of Barriers

According to the informant's, the two organizations faced different challenges and barriers. Kotter (1995) identified the importance of empowering others through the removal of barriers, in other words enabling an organization's employees to try new approaches, develop new ideas, and push forward. Kotter (1995; 2002) addresses four significant barriers, namely: structures, skills, systems, and supervisors. Barriers which other studies seem to agree with

(Cacioppe, 1998; Klidas et al., 2007; Paper, Rodger & Pendharkar, 2001). Since the two organizations faced different barriers, the discussion will be split up in barriers for data sharer and data receiver.

5.2.5.1 Data Sharer

According to the findings from the empirical results, the perhaps most significant barrier for Aker BP to overcome was to get control of their data and make it accessible. By not having control of their data, Aker BP was unable to share it, and utilize its potential. Thereby disempowering the organization from implementing their vision of digitizing every operation from cradle-to-grave. This barrier can be compared to Kotter's (2002) system barriers, or more specifically information barriers, which relates to information flow and usage. Aker BP realized that in order to facilitate data sharing, it had to be liberated, that is made accessible and combined into one system.

Aker BP's solution was to establish a new and independent organization named Cognite, which provided a data platform and thereby overcoming the barrier linked to data liberation. By creating an external data platform, Aker BP overcame barriers linked to information systems as well as organizational structures (Kotter, 2002). Now, whenever a new actor wishes to receive data they do not have to go through a bureaucratic windmill to receive it, they just have to get access to the platform. Not having to address several people in the organization and search through various data silos and information systems in order to get the data. Kotter also (1995) points to skills and the appropriation of competence as one of the significant barriers. By forming Cognite, Aker BP did not need to invest large amounts resources and hire new competency inside of their organization to create the data platform on their own and thereby avoiding barriers in regard to skills and new competence. The empirical results showed that the reasons for creating a new and independent organization were similar to those of not wanting to acquire the knowledge to utilize their equipment's performance data by themselves. As mentioned earlier, the informants from Aker BP stated that they sought to be experts at oil exploration and production, and not experts on their supplier's equipment nor become an information technology company.

Lastly, Kotter (1995) pointed to supervisors who refuse to change as a significant barrier. As mentioned in chapter 5.2.2, the guiding coalition consisted off the top management from both the organization's and the empirical results indicate that there have been no challenges linked to resistant supervisors.

5.2.5.2 Data Receiver

Several of the informants stated that increased access to data opens up numerous possibilities, but that does not help if the employees are not capable of taking advantage of it. One of the most significant barriers for the data receiver were therefore associated with people and orchestration. The thesis at hand found that in order to change this the employes had to learn to become more data-driven, which aligns with Kotter (1995) who also stated that change often requires the acquisition of new knowledge through learning and training, which is linked to Kotter's (1995) barrier of skills. It was explicitly two categories the informants mention that was important to becoming more data-driven, namely taking decisions based on information deriving from data and working in ways that allow for this.

5.2.6 Short-Term Wins

Researchers agree that short-term victories are essential in order to complete large scale transformation processes (Kotter, 1995; Marks, 2007; Pietersen, 2002; Reichers, Wanous & Austin, 1997). The informants from all three organizations pointed to working incrementally as extremely important for the change initiative. In other words, aiming first for the lower hanging fruits before aiming for bigger things. One can hypothesize that working incrementally is equal to reaching short term goals in order to create momentum within the organization. Also, seeing value being created quickly through lower hanging fruits helps to build confidence in the change effort. Creating a belief that the more prominent achievements and overarching aims is within reach, which is similar to the findings of previous studies (Kotter, 1995; Pietersen, 2002). They also mentioned working use case based as necessary, where one always tries to solve a specific problem, which creates value as fast as possible using the data. By looking to solve a specific problem, one also actively looks for short term wins in the form of value creation and

performance improvements, instead of being passive and hoping for them, which is in line with Kotter (1995).

5.2.7 Still More Change

By the time the empirical results were gathered, the first major project was more or less complete, the pilot project, and the two organizations were at that time monitoring the results. However, one informant from Aker BP explained that change efforts like this never really ends and that they needed to keep the wheel turning, always looking for improvements and modifications. Which is in line with Kotter (1995) who argues that a major pitfall is declaring victory too early and that managers have a tendency to proclaim the change effort as successful at the first sign of improvements. The informants from Aker BP further explained that the change initiative took longer than expected, but that they now wanted to apply what they have learned from the pilot on over to other projects, keeping the momentum and motivation (Coleman, 1998; Kotter, 1995; Dick, 1995) — further confronting old systems and structures (Kotter, 1995). Another essential empirical finding in regard to creating still more change is the introduction of the performance-based contract, which incentivizes Framo to always strive for better products and services. In other words, incentivizing Framo to always keep on changing and overcoming new barriers.

5.2.8 New Approaches

Due to the timing of this thesis compared to how long the change initiative had lasted, the results are scarce in regard to significant cultural changes. This because changing an organization's culture is a long and exhaustive process (Kotter 1995). However, the empirical results indicate that especially Aker BP tries to create a cultural shift both internally within the organization and externally in the ecosystem. This is exemplified by the Chief Executive Officer of Aker BP, who at conferences wears a t-shirt promoting the change initiative instead of wearing suit and tie — indicating that the new change initiative is the Aker BP way of doing things. It is safe to assume that the Chief Executive Office of Aker BP embodies the change effort and the new culture, and makes an effort to implement it into the organization. Something

which Kotter (1995) argues as being extremely important for the success of change initiatives. One can also argue that since the guiding coalition consisted of members from top management, it is unlikely that new members would have opposing views of the change initiative. Meaning that the requirements for promotion are in line with the ideas of the change initiative, which Kotter (1995) argues as essential to institutionalize the changes.

5.2.9 Summary - Change Management

In the very beginning of chapter 5.2, this question was raised: *how can the change initiative be better understood?* During this chapter, the empirical conclusion has been discussed in light of Kotter's (1995) eight-step change framework.

The empirical conclusion on change management puts forth several key findings which can be recognized in Kotter's (1995) framework. Firstly, the empirical findings and Kotter (1995) both point out the importance of establishing sufficient urgency within the organization. Secondly, having aligned visions anchored in an active management with shared goals between the organizations were emphasized as essential for carrying out the changes needed, as well as clearly communicating the visions and goals throughout the organizations. Which ties well with Kotter's (1995) second, third, and fourth step about creating a guiding coalition, creating a vision, and communicating it. Thirdly, the data sharer had to liberate its data in order to successfully share it, while the data receiver had to become more data-driven to utilize the shared data fully. Overcoming barriers that hindered the change, just as Kotter (1995) argued for in step five; empowering others to act on the vision. Fourthly, working on projects within the change initiative incrementally and use case based allowed the organizations to always try to create value as soon as possible. Actively creating a form for short-term wins, which, according to Kotter (1995) is essential to complete large scale transformation processes successfully. Lastly, the informants stated that the change initiative took longer than expected, but they were now actively taking what they learned through the project and applying it to new ones. Continuing to implement the change as the seventh step of Kotter (1995) argues for. Due to the change effort still being in an early stage, it was hard finding any significant cultural changes within the organizations, which is Kotter's (1995) last and final step. With this in mind, it is safe to claim that the change initiative can be better understood in light of Kotter (1995) as

it helps one understand actions and consequences of the change effort, in other words, helps to understand the dynamics of the change effort.

It seems that the framework is well suited for successfully managing change in the context of industrial data sharing. This because many of the empirical findings can also be recognized in the framework (Kotter, 1995), and that there were small deviations in regard to success factors. However, it can be argued that the framework is too sequential and that some modifications must be made in order for it to work optimally. Many of the developments of the case at hand did take place in parallel and not sequence. Herrero (2006) argues that if one were to follow Kotter's (1995) recommendation of following the steps in strict sequence one could not establish a sense of urgency while at the same time establish a guiding coalition or overcoming barriers. Arguably also being the case in the study at hand. The Cognite Data Platform was for example not developed overnight which means that Aker BP did probably not stop communicating their vision or halt the planning of short-term goals for the change initiative while Cognite created the platform. Appelbaum et al. (2012) agree with the argumentation that Kotter's (1995) framework is to sequential, and takes it further claiming that not all transformations can undergo all steps, nor is required to. Which mainly was the case in regard to the shared vision between Aker BP and Framo. Researchers seem to agree that modifications must be done to the framework in order for it to work optimally in the given context, which the results of this thesis agree with (Appelbaum et al. 2012; Dopson, Fitzgerald & Ferlie, 2008; Graetz & Smith, 2010).

6. Conclusion

After discussing the empirical conclusion given in chapter 4.4 in the context of previous research and theory in chapter five, it is essential to go back to the overarching problem formulation of this thesis which is: *what are the organizational consequences of industrial data sharing?* In essence, one can conclude that there are two main organizational consequences of industrial data sharing. Hereunder, theoretical consequences, and practical consequences. These consequences are put forth in this chapter.

6.1 Theoretical Implication

This chapter pinpoints the specific theoretical implications or consequences which industrial data sharing brings and implications for further theoretical development. First, starting from a strategic management point of view, and then in the view of change management.

After discussing the empirical conclusion in light of both conventional strategic management and the industrial network perspective, one can conclude that conventional strategic management is incompatible in the context of industrial data sharing. This is because the underlying ideology of conventional strategic management is a polarization to the ideologies of industrial data sharing. It was, however, concluded that the industrial network perspective is better suited for the context of industrial data sharing since it has its main focus on organizational mutualism and coevolution, which is essential for industrial data sharing. Consequently, this means that when studying phenomenon in regard to industrial data sharing, one cannot use conventional strategic management models as a means for discussion or as a framework. Instead, one should use the industrial network perspective as a starting point and framework, due to its coinciding aspects with industrial data sharing. One could speculate that this does not only apply to when studying phenomenon within the context of industrial network sharing but also applies for further theoretical developments within this context. Meaning that when developing new theories, one should use the industrial network perspective as a starting point, and not models within the conventional strategic management literature.

Furthermore, a significant consequence of industrial data sharing is the change initiative it initiated. To get a better understanding of the dynamics of the change effort, the effort was discussed using Kotter's (1995) framework for change management. It became clear that the framework had its limitations in regard to being too sequential, as pointed out by other researchers as well (Appelbaum et al., 2012; Herrero, 2006). However, it was still regarded as a good fit for the context, as it contributed to the understanding of the dynamics of the change effort. Meaning that one could conclude that Kotter's (1995) framework is well suited when studying change initiatives within the context of industrial data sharing, as long as one modifies the framework to suit the specific context (Appelbaum et al. 2012; Dopson, Fitzgerald & Ferlie, 2008; Graetz & Smith, 2010).

Conclusively, when studying phenomena within the context of industrial data sharing one should renounce the conventional strategic management literature and instead focus on the industrial network perspective. It was further speculated that this also applies to theoretical developments within the context. Moreover, it was also concluded that Kotter's (1995) framework for change is well suited for studying change efforts within industrial data sharing if modified to the context of the change initiative.

6.2 Implications for Practice

This chapter pinpoints the specific practical implications or consequences which industrial data sharing brings. In other words, how organizations should work with strategic management and change management in the context of industrial data sharing. First, starting with a strategic management point of view, and then in the view of change management.

It was earlier concluded in this chapter that the conventional strategic management literature falls apart in the context of industrial data sharing and that the industrial network perspective was a better-suited model. This means that when organizations wish to strategize and plan for industrial data sharing, they should with great benefit use the industrial network perspective as a starting point, and not the conventional strategic management literature. More specifically, organizations should renounce the focus on competitive advantage over others and instead

direct one's attention towards organizational performance. Industrial data sharing has its basis in the fact that no organization is complete and not in control of all the competencies and resources it needs in order to gain optimal performance, which coincides well with the industrial network perspective (Ford, 2011; Gadde, Huemer & Håkansson, 2003).

Furthermore, it was established that a significant change initiative followed the implementation of industrial data sharing within Aker BP and Framo. This change initiative was studied using Kotter's (1995) change management framework, where it was concluded that the framework was apt for studying the change initiative, even though there were little empirical findings in regard to the last step due to the timing of the thesis. Leading one to believe that Kotter's eight steps of change (1995) is a well suited management tool when planning for and working with the implementation of industrial data sharing, as long as one modifies the framework to suit the specific context (Appelbaum et al. 2012; Dopson, Fitzgerald & Ferlie, 2008; Graetz & Smith, 2010).

Conclusively, when organizations are planning for and working with the implementation of industrial data sharing, they should renounce the conventional strategic management literature and instead focus on the industrial network perspective. In other words, organizations should broaden their strategic focus from the internal resources of the organization to how it relates to the ecosystem and its resources. It was further concluded that Kotter's (1995) framework for change is a well-suited framework for the planning, implementing and leading of change efforts linked to industrial data sharing if modified to the context of the change initiative.

6.3 Further Research

Industrial data sharing within the oil and gas industry is a very narrow, intricate, and new phenomenon, where little to no prior research has been conducted on the notion. A natural extension of this study would have been to further follow the case at hand and over a more extended period. As mentioned earlier, when this thesis was conducted Aker BP and Framo had just completed the first pilot and were monitoring the results. It was, therefore, too early to say whether industrial data sharing did achieve the overarching aims or not. There are many opinions within the industry whether the industrial data sharing effort really is profitable, one

would, therefore, believe that further studying the fruit it bears would have been of great benefit for the industrial data sharing literature.

This thesis is limited to only three actors, one data sharer, one data receiver, and one data sharing enabler. It would, therefore, be interesting to further study a more extensive network of data sharers, receivers and platforms in order to see if the findings of this thesis are scalable to more extensive networks. Furthermore, industrial data sharing also affects the data receiver's suppliers, whom in this study was neglected. Studying how they are affected would perhaps be rewarding for the industrial data sharing literature, as one could speculate that they indeed are affected by the notion as well.

All things considered, there is as of now little empirical studies on the notion of industrial data sharing, and any contribution which provides some empirical results would be of importance for the industrial data sharing literature, even studies outside of the oil and gas industry.

7. References

- Ackoff, R.L., 1989. From data to wisdom. *Journal of applied systems analysis*, *16*(1), pp.3-9.
- Andrews, K.R., 1971. *The concept of corporate strategy*, Homewood, Ill: Dow Jones-Irwin.
- Appelbaum, S. et al., 2012. Back to the future: revisiting Kotter's 1996 change model. *The Journal of Management Development*, 31(8), pp.764–782.
- Armenakis, A.A. & Harris, S.G., 2009. Reflections: our Journey in Organizational Change Research and Practice. *Journal of Change Management*, 9(2), pp.127–142.
- Armenakis, A.A., Harris, S.G. & Mossholder, K.W., 1993. Creating Readiness for Organizational Change. *Human Relations*, 46(6), pp.681–703.
- Arnaut, C. et al., 2018. *Study on data sharing between companies in Europe final report.*, Luxembourg: Publications Office.
- Askheim, O.G.A. & Grenness, T., 2008. *Kvalitative metoder for markedsføring og organisasjonsfag*, Oslo: Universitetsforl.
- Babbie, E.R., 2013. *The practice of social research* 13th ed., Australia: Wadsworth Cengage Learning.
- Baraldi et al., 2007. Strategic thinking and the IMP approach: A comparative analysis. *Industrial Marketing Management*, 36(7), pp.879–894.
- Barney, J., 1991. Firm Resources and Sustained Competitive Advantage. *Journal of Management*, 17(1), pp.99–120.
- Barton Cunningham, J. & Kempling, J.S., 2009. *Management Decision*, 47(2), pp.330–344.
- Beer, M. & Nohria, N., 2000. *Breaking the code of change*, Boston, Mass: Harvard Business School.
- Blackwell, D., 1953. Equivalent Comparisons of Experiments. *The Annals of Mathematical Statistics*, 24(2), pp.265–272.
- Bordia, P. et al., 2004. Uncertainty during organizational change: Is it all about control? *European Journal of Work and Organizational Psychology*, 13(3), pp.345–365.

- Brynjolfsson, E., Hitt, L.M. and Kim, H.H., 2011. Strength in numbers: How does data-driven decisionmaking affect firm performance? *Available at SSRN 1819486*.
- Burnes, B., 2009. *Managing change: a strategic approach to organisational dynamics* 5th ed., Harlow: Financial Times/Prentice Hall.
- Byrne, M., 2001. Interviewing as a data collection method. *AORN Journal*, 74(2), pp.233–235.
- Cacioppe, R., 1998. Structured empowerment: An award-winning program at the Burswood Resort Hotel. *Leadership & Organization Development Journal*, 19(5), pp.264–274.
- Caldwell, R., 2003. *Leadership & Organization Development Journal*, 24(5), pp.285–293.
- Campbell, D.T. & Stanley, J.C., 1966. *Experimental and quasi-experimental designs for research*, Boston, U.S.A: Houghton Mifflin Co.
- Campbell, D.T., 1975. III. "Degrees of Freedom" and the Case Study. *Comparative Political Studies*, 8(2), pp.178–193.
- Chaffey, D. & Wood, S., 2005. *Business information management: improving performance using information systems*, New York: Financial Times Prentice Hall.
- Coleman, B., 1998. *The Wall Street Journal: the story of Dow Jones & the nation's business newspaper*, Chicago: Rand McNally.
- Creswell, J.W., 2009. *Research design: qualitative, quantitative, and mixed methods approaches* 3rd ed., Los Angeles: SAGE.
- Crotty, M., 1998. *The foundations of social research: meaning and perspective in the research process*, London: Sage.
- Cunningham, J. Barton & Kempling, James S., 2009. Implementing change in public sector organizations. (Report). *Management Decision*, 47(2), pp.330–344.
- Deichmann, J. et al., 2016. Creating a successful Internet of Things data marketplace. *McKinsey & Company*.
- Dick, T.D., 1995. Accelerating change for competitive advantage. *Organizational Dynamics*, 24(1), pp.77–82.
- DNV GL (2019) *A TEST OF RESILIENCE: The outlook for the oil and gas industry in 2019.* Høvik: DNV GL. Accessible from: https://industryoutlook.dnvgl.com/2019/download (Access Date: 21.05.2019).

- Dopson, S., Fitzgerald, L. & Ferlie, E., 2008. Understanding Change and Innovation in Healthcare Settings: Reconceptualizing the Active Role of Context. *Journal of Change Management*, 8(3-4), pp.213–231.
- Dwyer, F.R., Schurr, P.H. & Oh, S., 1987. Developing buyer-seller relationships. *Journal of marketing*, *51*(2), pp.11-27.
- Eysenck, H.J., 1976. *Case studies in behaviour therapy*, London: Routledge and Kegan Paul.
- Fisher, L., 1994. Total quality: hit or myth? *Accountancy, April*, pp.50-1.
- Flamholtz, E. & Kurland, S., 2006. Making strategic planning work: a case study of Countrywide Financial. *Handbook of Business Strategy*, 7(1), pp.187–193.
- Flyvbjerg, B., 2006. Five Misunderstandings About Case-Study Research. *Qualitative Inquiry*, 12(2), pp.219–245.
- Ford, D., 2011. *Managing business relationships* 3rd ed., Chichester: Wiley.
- Frahm, J. & Brown, K., 2007. First steps: linking change communication to change receptivity. *Journal of Organizational Change Management*, 20(3), pp.370–387.
- Gadde, L. E., Huemer, L., & Håkansson, H. (2003). Strategizing in industrial networks. *Industrial marketing management*, *32*(5), 357-364.
- Galbraith, J.R., 1973. *Designing complex organizations*, Reading, Mass: Addison-Wesley.
- Gibbs, G., 2007. *Analyzing Qualitative Data*, London: SAGE Publications, Ltd.
- Gist, M.E. et al., 1989. Effects of Alternative Training Methods on Self-Efficacy and Performance in Computer Software Training. *Journal of Applied Psychology*, 74(6), pp.884–891.
- Graetz, F. & Smith, A.C.T., 2010. Managing Organizational Change: A Philosophies of Change Approach. *Journal of Change Management*, 10(2), pp.135–154.
- Grant, R.M., 1998. *Contemporary strategy analysis* 3rd ed., Blackwell Business, Massachusetts.
- Grant, R.M., 1998. *Contemporary strategy analysis* 3rd ed., Blackwell Business, Massachusetts.
- Håkansson, H. and Snehota, I., 1989. No business is an island: The network concept of business strategy. *Scandinavian journal of management*, *5*(3), pp.187-200.
- Håkansson, H., 1990. Technological collaboration in industrial networks. *European Management Journal*, 8(3), pp.371–379.

- Herrero, L., 2006. *Viral Change: The alternative to slow, painful and unsuccessful management of change in organisations Meeting Minds* 2nd ed., Idea Worth Pres.
- Higgs, M. & Rowland, D., 2000. Building change leadership capability: 'The quest for change competence.' *Journal of Change Management*, 1(2), pp.116–130.
- Hirschhorn, L., 2002. Campaigning for change. *Harvard Business Review*, 80(7), pp.98–104.
- Hofisi, C., Hofisi, M. & Mago, S., 2014. Critiquing interviewing as a data collection method. *Mediterranean Journal of Social Sciences*, 5(16), pp.60–64.
- Jacobsen, D.I., 2005. *Hvordan gjennomføre undersøkelser?: innføring i samfunnsvitenskapelig metode* 2nd. ed., Kristiansand: Høyskoleforl.
- Johannessen, A., Christoffersen, L. & Tufte, P.A., 2011. *Forskningsmetode for økonomisk-administrative* fag 3rd. ed., Oslo: Abstrakt forl.
- Keith, B. et al., 2016. *Strategic Sourcing in the New Economy: Harnessing the Potential of Sourcing Business Models for Modern Procurement*, New York.
- Kerlinger, F.N., 1986. *Foundations of behavioral research* 3rd ed., Forth Worth, Tex: Harcourt Brace Jovanovich College Publ.
- King, N. & Horrocks, C., 2010. *Interviews in qualitative research*, London: Sage.
- Klidas, A. et al., 2007. Managing employee empowerment in luxury hotels in Europe. *International Journal of Service Industry Management*, 18(1), pp.70–88.
- Knodel, T., 2004. Preparing the organizational 'soil' for measurable and sustainable change: business value management and project governance. *Journal of Change Management*, 4(1), pp.45–62.
- Kotter, J.P. & Cohen, D.S., 2002. *The heart of change: real-life stories of how people change their organizations*, Boston, Mass: Harvard Business Review Press.
- Kotter, J.P., 1995. Leading change - why transformation efforts fail. *Harvard Business Review*, 73(2), pp.59–67.
- Kotter, J.P., 2008. *A sense of urgency*, Boston, Mass: Harvard Business Press.
- Kvale, S. et al., 2009. *Det kvalitative forskningsintervju* 2nd. ed., Oslo: Gyldendal akademisk.
- Lee, A.S., 1989. A Scientific Methodology for MIS Case Studies. *MIS Quarterly*, 13(1), p.33.
- Lincoln, Y.S. & Guba, E.G., 1985. *Naturalistic inquiry*, Beverly Hills, Calif: Sage.
- Lo Iacono, V., Symonds, P. & Brown, D.H.K., 2016. Skype as a Tool for Qualitative Research Interviews. *Sociological Research Online*, 21(2), pp.1–15.

- Manyika, J. et al., 2013. Open data: Unlocking innovation and performance with liquid information. *McKinsey Global Institute*, *21*..
- Marks, M.L.L., 2007. A framework for facilitating adaptation to organizational transition. *Journal of Organizational Change Management*, 20(5), pp.721–739.
- Miles, M.B. & Huberman, A.M., 1994. *Qualitative data analysis: an expanded sourcebook* 2nd ed., Thousand Oaks, Calif: Sage.
- Moran, J. & Brightman, B., 2000. Leading organizational change. *Journal of Workplace Learning*, 12(2), pp.66–74.
- Nelissen, P. & van Selm, M., 2008. Surviving organizational change: how management communication helps balance mixed feelings. *Corporate Communications: An International Journal*, 13(3), pp.306–318.
- Noy, C., 2008. Sampling Knowledge: The Hermeneutics of Snowball Sampling in Qualitative Research. *International Journal of Social Research Methodology*, 11(4), pp.327–344.
- *NVivo (2019)* Accessible from: https://www.qsrinternational.com/nvivo/home (Access date: 22.05.2018)
- Paper, D., Rodger, J. & Pendharkar, P., 2001. A BPR case study at Honeywell. *Business Process Management Journal*, 7(2), pp.85–99.
- Patton, M.Q., 1990. *Qualitative evaluation and research methods* 2nd ed., Newbury Park: Sage.
- Penrose, E., 1959. The theory of the growth of the firm. *John Wiley & Sons, New York*.
- Pietersen, W., 2002. The Mark Twain dilemma: the theory and practice of change leadership. *Journal of Business Strategy*, 23(5), pp.32–37.
- Porter, M.E., 1980. *Competitive strategy: techniques for analyzing industries and competitors*, New York: Free Press.
- Premkumar, G., Ramamurthy, K. & Saunders, Carol Stoak, 2003. Information Processing View of Organizations: An Exploratory Examination of Fit in the Context of Interorganizational Relationships. *Journal of Management Information Systems*, 22(1), pp.257–294.
- Ragin, C.C. & Becker, H.S., 1992. *What is a case?: exploring the foundations of social inquiry*, Cambridge: Cambridge University Press.
- Reichers, A.E., Wanous, J.P. & Austin, J.T., 1997. Understanding and Managing Cynicism about Organizational Change. *The Academy of Management Executive (1993-2005)*, 11(1), pp.48–59.

- Richards, K., 2003. *Qualitative Inquiry in TESOL*, London.
- Rieley, J. & Clarkson, I., 2001. The impact of change on performance. *Journal of Change Management*, 2(2), pp.160–172.
- Rowley, J., 2007. The wisdom hierarchy: representations of the DIKW hierarchy. *Journal of Information Science*, 33(2), pp.163–180.
- Rumelt, R.P., Schendel, D.E. & Teece, D.J., 1994. *Fundamental issues in strategy: a research agenda*, Boston, Mass: Harvard Business School Press.
- Saldaña, J., 2011. *Fundamentals of qualitative research*, Oxford: Oxford University Press.
- Sapsford, R., Jupp, V. & Open University, 2006. *Data collection and analysis* 2nd ed., London: SAGE Publications in association with the Open University.
- Schramm, W., 1971. *Notes on Case Studies of Instructional Media Projects*.
- Sirkin, H., Keenan, P. & Jackson, A., 2005. The hard side of change management. *Harvard Business Review*, 83(10), pp.108–118.
- Smith, Vince C., Sohal, Amrik S. & D'Netto, Brian, 1995. Successful strategies for managing change. (Human Resources Management in Australasia). *International Journal of Manpower*, 15(5), p.22.
- Spelman, M. et al., (2017) *Digital Transformation Initiative Oil and Gas Industry*. (REF 060117) Cologny/Geneva: Accenture & World Economic Forum. Accessible from: http://reports.weforum.org/digital-transformation/wp-content/blogs.dir/94/mp/files/pages/files/dti-oil-and-gas-industry-white-paper.pdf (Access Date: 21.05.2019)
- Teece, D.J., Pisano, G. & Shuen, A., 1997. Dynamic capabilities and strategic management. *Strategic management journal*, 18(7), pp.509–533.
- Thompson, A.A. & Strickland, A.J., 1990. *Strategic management: concepts and cases* 5th ed., Chicago, Ill: Irwin.
- Tjora, A.H., 2017. *Kvalitative forskningsmetoder i praksis* 3rd. ed., Oslo: Gyldendal akademisk.
- Tracy, S.J., 2010. Qualitative Quality: Eight "Big-Tent" Criteria for Excellent Qualitative Research. *Qualitative Inquiry*, 16(10), pp.837–851.
- Vitasek, K., 2016. Strategic sourcing business models. *Strategic Outsourcing*, 9(2), pp.126–138.
- Wernerfelt, B., 1984. A resource-based view of the firm. *Strategic Management Journal*, 5(2), pp.171–180.

- Whelan-Berry, K.S. & Somerville, K.A., 2010. Linking Change Drivers and the Organizational Change Process: A Review and Synthesis. *Journal of Change Management*, 10(2), pp.175–193.
- Wilkinson & Young, 2002. On cooperating: firms, relations and networks. *Journal of Business Research*, 55(2), pp.123–132.
- Wright, K. & Thompsen, J., 1997. Building the peoples capacity for change. *The TQM Magazine*, 9(1), pp.36–41.
- Yin, R.K., 1989. *Case study research: design and methods* Rev., Newbury Park: Sage.
- Yin, R.K., 2017. *Case study research: design and methods* 6th ed., Los Angeles, Calif: SAGE.

8. Appendix

Appendix 1

NSD NORSK SENTER FOR FORSKNINGSDATA

NSD sin vurdering

Prosjekttittel

Potential of Industrial Data Sharing in the Oil & Gas Industry

Referansenummer

569239

Registrert

14.02.2019 av Jonas Nilsberg Refsnæs - jonasnr@stud.ntnu.no

Behandlingsansvarlig institusjon

NTNU Norges teknisk-naturvitenskapelige universitet / Fakultet for økonomi (ØK) / NTNU Handelshøyskolen

Prosjektansvarlig (vitenskapelig ansatt/veileder eller stipendiat)

Roar Stokken, roarsto@ntnu.no, tlf: 45240204

Type prosjekt

Studentprosjekt, masterstudium

Kontaktinformasjon, student

Jonas Nilsberg Refsnæs, jonas.refsnes@gmail.com, tlf: 41214994

Prosjektperiode

07.01.2019 - 23.05.2019

Status

20.02.2019 - Vurdert

Vurdering (1)

20.02.2019 - Vurdert

Det er vår vurdering at behandlingen av personopplysninger i prosjektet vil være i samsvar med personvernlovgivningen så fremt den gjennomføres i tråd med det som er dokumentert i meldeskjemaet med vedlegg den 20.02.2019. Behandlingen kan starte.

MELD ENDRINGER
Dersom behandlingen av personopplysninger endrer seg, kan det være nødvendig å melde dette til NSD ved å oppdatere meldeskjemaet. På våre nettsider informerer vi om hvilke endringer som må meldes. Vent på svar før endringer gjennomføres.

TYPE OPPLYSNINGER OG VARIGHET
Prosjektet vil behandle alminnelige kategorier av personopplysninger frem til 23.08.2019.

LOVLIG GRUNNLAG
Prosjektet vil innhente samtykke fra de registrerte til behandlingen av personopplysninger. Vår vurdering er at prosjektet legger opp til et samtykke i samsvar med kravene i art. 4 og 7, ved at det er en frivillig, spesifikk, informert og utvetydig bekreftelse som kan dokumenteres, og som den registrerte kan trekke tilbake. Lovlig grunnlag for behandlingen vil dermed være den registrertes samtykke, jf. personvernforordningen art. 6 nr. 1 bokstav a.

PERSONVERNPRINSIPPER
NSD vurderer at den planlagte behandlingen av personopplysninger vil følge prinsippene i personvernforordningen om:

- lovlighet, rettferdighet og åpenhet (art. 5.1 a), ved at de registrerte får tilfredsstillende informasjon om og samtykker til behandlingen
- formålsbegrensning (art. 5.1 b), ved at personopplysninger samles inn for spesifikke, uttrykkelig angitte og berettigede formål, og ikke behandles til nye, uforenlige formål
- dataminimering (art. 5.1 c), ved at det kun behandles opplysninger som er adekvate, relevante og nødvendige for formålet med prosjektet
- lagringsbegrensning (art. 5.1 e), ved at personopplysningene ikke lagres lengre enn nødvendig for å oppfylle formålet

DE REGISTRERTES RETTIGHETER
Så lenge de registrerte kan identifiseres i datamaterialet vil de ha følgende rettigheter: åpenhet (art. 12), informasjon (art. 13), innsyn (art. 15), retting (art. 16), sletting (art. 17), begrensning (art. 18), underretning (art. 19), dataportabilitet (art. 20).
NSD vurderer at informasjonen om behandlingen som de registrerte vil motta oppfyller lovens krav til form og innhold, jf. art. 12.1 og art. 13.
Vi minner om at hvis en registrert tar kontakt om sine rettigheter, har behandlingsansvarlig institusjon plikt til å svare innen en måned.

FØLG DIN INSTITUSJONS RETNINGSLINJER
NSD legger til grunn at behandlingen oppfyller kravene i personvernforordningen om riktighet (art. 5.1 d), integritet og konfidensialitet (art. 5.1. f) og sikkerhet (art. 32).
Dersom du benytter en databehandler i prosjektet må behandlingen oppfylle kravene til bruk av databehandler, jf. art 28 og 29.

For å forsikre dere om at kravene oppfylles, må dere følge interne retningslinjer og/eller rådføre dere med behandlingsansvarlig institusjon.

OPPFØLGING AV PROSJEKTET
NSD vil følge opp ved planlagt avslutning for å avklare om behandlingen av personopplysningene er

avsluttet.

Lykke til med prosjektet!
Tlf. Personverntjenester: 55 58 21 17 (tast 1)

Organizational Consequences of Industrial Data Sharing

NTNU

Kunnskap for en bedre verden