Norwegian School of Economics

Bergen, Spring 2014

Commercialization of Petroleum Technology

A Case Study of EMGS's Business Model and the Commercialization of Their Marine CSEM Technology

Mari Danielsen Lunde

Supervisor: Svein Ulset

Master Thesis in Strategy and Management

NORWEGIAN SCHOOL OF ECONOMICS

Abstract

This master thesis is a case study, and deals with the business model's role in the commercialization process of petroleum technology. The case being studied is Norwegian geophysical service company EMGS and their marine CSEM technology, a technology supporting oil companies in their search for oil and gas. EMGS was established in 2002, in order to commercialize this technology. Through the exploration of EMGS's business model throughout the years, this thesis tries to identify why EMGS and the marine CSEM technology has not yet achieved the predicted commercial success.

The theoretical basis is general literature on the business model concept, as well as literature on value creation, value delivery and value capture. The literature served as a basis to identify concepts and ideas that were interesting to study further in the research process. The empirical data is collected through interviews with key employees at EMGS and supported through extensive written documentation.

The thesis identifies characteristics of EMGS's business model, and why the marine CSEM technology has not yet become an integrated part of oil companies' exploration toolkit. One problematic area is the delivery of after-sales services. The oil companies lack knowledge about the technology, and need support in the interpretation phase. However, they are hesitant to share necessary information and data with EMGS. Another problem is the pre-sales and marketing efforts. The technology has a potential 90 % success rate, but there are still large amounts of skeptics. This implies that the marketing procedures should be improved. Another key finding is the oil companies' strong bargaining power, hindering EMGS's value capture. It is also discovered through the thesis that outside events like the financial crisis have affected EMGS's opportunities to deliver value.

At the end, some recommendations for the further commercialization process of the marine CSEM technology are proposed.

Acknowledgements

This thesis is written as part of my MSc in Economics and Business Administration at Norwegian School of Economics the fall of 2013 and the first months of 2014. It is written within the area of Strategy and Management, which has been my main master profile.

I would first of all like to thank my thesis supervisor, Professor Svein Ulset, for introducing me to this interesting topic, being highly dedicated, always accessible, and for all the help and support provided to me.

I would also like to express my sincerest gratitude to EMGS and its representatives for giving me access to their organization, providing me with information, and for being positive and open throughout the whole process.

I hope that this study can be of use to EMGS, and that it can provide more knowledge about the business model's role in the commercialization process of new technology.

Mari Danielsen Lunde

Stavanger, April 2014

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1. Introduction

1.1 Purpose

The purpose of this thesis is to explore the characteristics of the Norwegian company EMGS's business model, and its role in the commercialization process of the company's innovative marine CSEM technology.

When introduced in 2002, this technological innovation was marketed to oil companies as the ideal technology, highly capable of detecting oil and gas without having to drill wells. In 2007, EMGS was listed on the Oslo Stock Exchange, valued at a sensational 10 billion NOK (Warburg Pincus, 2007). The marine CSEM technology was supposed to revolutionize the exploration process. However, in spite of initial praise and acclaim, EMGS's innovation has not reached its projected commercial success and it is still not a standard part of oil and gas exploration toolkits. The question to be asked is; what happened? Why haven't EMGS and its marine CSEM technology revolutionized the oil and gas exploration phase, as previously predicted? In order to investigate this, a proper analysis of EMGS's business model is needed, and that is what this study aims to do.

1.1.1 Business Model and Commercialization

A new technology alone has no objective economic value; for economic value to be developed, the new technology needs to be commercialized (H. Chesbrough, 2010). Commercialization can be defined as; "an attempt to profit from innovation by incorporating new technologies into products, processes and services and selling them in the market place" (U.S. Congress, 1995, p. 2). Successful commercialization of an innovation needs to be supported by a suitable business model. The ability to create, deliver and capture value is essential for achieving a sustainable and satisfying degree of commercialization for new technologies (Corkindale, 2008).

"A mediocre technology pursued within a great business model may be more valuable than a great technology exploited via a mediocre business model" (H. Chesbrough, 2010, p. 354)

This quote from Henry Chesbrough shows the importance of an appropriate and efficient business model while attempting to commercialize a new technology. If the same technology

were being brought to market through two different business models, the economic outcome and financial returns would be different. If a competing firm uncovers a business model more appropriate for the technology in question, this firm may create, deliver and capture far more value than the innovating firm (H. Chesbrough, 2010). The small beverage company RC Cola was the first company to introduce canned cola and diet cola. However, both Coca Cola and Pepsi followed shortly after and made most of the profits from RC Cola's innovations. The company Electrical Musical Industries (EMI) invented the world's first commercial CT scanner, the EMI CAT scanner. Yet, EMI went out of business a few years after introducing the first CT scanner. British aviation manufacturer De Havilland was the first company to produce a passenger airplane, but was unable to compete with later entrants Boeing and Airbus (Teece, 1986). These examples show the importance of an appropriate business model – as technological innovation by itself is not synonymous with economic and commercial success. For a company's technical success to be transformed into economic and commercial success, the technological innovation needs to be combined with a suitable business model (Teece, 2010). Otherwise, a company will most likely have the same fate as De Havilland and RC Cola.

1.1.2 The Case of EMGS

Electromagnetic GeoServices ASA (EMGS) is a Norwegian company in the oil and gas industry. The company uses electromagnetic energy to detect oil and gas for oil companies during the exploration process (The Financial Times, 2014).

The Seabed Logging technology, today known under the name marine CSEM, was developed in the Norwegian oil company Statoil's research department in the late 1990's. The inventors were Terje Eidesmo, Svein Ellingsrud and Ståle Johansen, then working as researchers for Statoil (EMGS, 2014b). This technology provides companies with an opportunity for detecting hydrocarbons beneath the seabed *before* drilling. It adds complementary information to seismic surveying, which is considered one of the most prominent tools in an oil company's exploration phase. EMGS was founded as a separate entity of Statoil in 2002, in order to commercialize the marine CSEM technology (Carstens, 2006).

EMGS reported revenues of 20 million NOK in 2002. In 2005, their revenues had risen to 300 million NOK (Ulset, 2007). In 2007, EMGS were listed on the Oslo Stock Exchange at

an initial public offering price of NOK 135 per share, at the top of its revised price range. The IPO was met with strong interest from investors, both Norwegian and international (Warburg Pincus, 2007). In 2012, the revenues of EMGS had risen to over 1,2 billion NOK (EMGS, 2013b). From its modest start as a subsidiary of Statoil with three employees, EMGS is today considered a pioneering, technological and market leader within the marine CSEM industry. EMGS have delivered more than 700 surveys across the world and employs more than 300 professionals (EMGS ASA, 2013). However, newspapers have also reported about problems from within the EMGS camp. "One Hour from Bankruptcy" and "Saved at Last Hour" are headlines that were printed in the Norwegian financial press in 2009 (DN.no, 2009). It is also a fact that the CSEM technology has not become as widely used as media and industry magazines predicted it to be.

The case of EMGS and their innovative technology represent an interesting case to study since the innovation is considered to have significant commercial potential. Successful commercialization of an innovation needs to be supported by a good business model. However, EMGS have so far failed to realize the full commercial potential of their innovation. EMGS's business model is therefore a very interesting case to explore and study further.

1.2 Research Question

This thesis will explore the role of the business model in achieving profitable commercialization of new technologies and capturing value from innovations, illustrated through the case of EMGS and their marine CSEM technology.

"What characterizes the business model EMGS initially were employing to commercialize their marine CSEM technology and capture value from the innovation? Have there been any major changes to this initial business model?"

The three key elements of a business model are: value creation, value delivery and value capture. I will explore the characteristics of these elements in the case of EMGS and their marine CSEM technology. I will explore how EMGS created, delivered and captured value initially and also explore changes throughout the years. Through the study of EMGS's business model, I will identify why EMGS and the marine CSEM technology has not

reached the commercial success and widespread use that it was predicted to reach.

1.3 Literature Review

Chapter 3, "Frameworks", presents existing literature on the topic of business model and commercialization, as well as the related topics "value creation", "value delivery" and "value capture". This literature serves as a way to identify concepts and ideas that seem interesting to explore further in the study. The following section comprises a summary of the literature that will be presented in further details in the "Framework" chapter.

On the general topic of business models, Teece (2010) is one of the contributors. Teece (2010) aims to increase the understanding of the business model's major significance, and explore the business model's links to business strategy, innovation management and economic theory. He states that the essence of a business model is in "defining the manner by which the enterprise delivers value to customers, entices customers to pay for value, and converts those payments to profit". Teece also states that the business model concepts lack an established theoretical foundation in business and economics as of today.

Chesbrough and Rosenbloom (2002) and Corkindale (2010) are other contributions on the topic of business models. Chesbrough and Rosenbloom's paper examines the role of the business model in capturing value from innovative technology. They state that a successful business model "creates a heuristic logic that connects technical potential with the realization of economic value". The business model is described as a "focusing device that mediates between technology development and economic value creation". The paper argues that it is necessary for firms to understand this role of the business model, in order to commercialize new technology and capture value from it. In Corkindale's paper, the main message and initial thrust is also that commercialization of innovative new technology has to be supported by a suitable business model.

Since the three essential functions of a business model are value creation, value delivery and value capture, literature on these three functions should be presented. Regarding value creation or value *proposition*, Magretta (2012) summarizes and reflects upon Michael Porter's thoughts on the topic. Magretta describes value proposition as the answer to three essential questions, illustrated through the so-called "value proposition triangle"; which

customers to serve, which needs to meet and what relative price to set. The value proposition shows the firm's choice about the specific kind of value it wishes to offer.

Magretta (2012) also reflects upon the topic of value delivery and the value chain; the value chain should always be tailored to the firm's value proposition. Magretta states that a distinctive value proposition is not sufficient alone, as "it will not translate into a meaningful strategy unless the best set of activities to deliver it is different from the activities performed by the rivals". "Porter's value chain" is a well-known framework widely applied for analysis of a firm's activity sets, and is presented further in the "Framework" chapter.

Regarding value capture, Teece (1986) discusses the appropriability regime, which refers to "the environmental factors, excluding firm and market structure, that govern an innovator's ability to capture the profits generated by an innovation". Teece states that the essential dimensions of the appropriability regime are the legal and natural mechanisms of protection. Patents, copyrights and trade secrets are listed as legal instruments of protection, while the nature of the knowledge – whether its tacit or codified – as well as the nature of the product and the process are listed as natural mechanisms of protection in Teece's paper. Hurmelinna & Puumalainen (2005) give further details about the appropriatbility regime. "Porter's five forces", the widely used framework for industry analysis developed by Michael Porter, sheds light upon another relevant area of the value capture topic; a firm's positioning in the vertical supply chain.

Together, this pre-existing literature on the topic of business models, value creation, value delivery and value capture, can identify elements and concepts interesting to study further.

1.4 Structure

The structure of the thesis is presented below with a brief description of each chapter.

Chapter 1 – Introduction

This section describes the background of the study, profiles EMGS and why it is an interesting case to study. This section also presents and defends the research question, as well as introducing the literature used in the study. Lastly, the structure of the study is described.

Chapter 2 – Methodology

This section presents and explains the choice of methodology associated with the research approach, research design, data collection and data analysis. Reliability, validity, interviewer/interviewee biases and ethical considerations are also examined.

Chapter 3 – Frameworks

This section describes the frameworks used in the study. The frameworks were not meant to be tested, but served as a way to identify concepts and ideas that seemed particularly interesting to investigate and explore further in the research process. General theory about "Business models" is presented first, followed by theory on the three key elements in a business model, "Value creation", "Value delivery" and "Value capture".

Chapter 4 – Empirical Data

This chapter presents the empirical findings, divided into "Value creation", "Value delivery" and "Value capture". It contains quotes from interviewees and the aspects and incidents identified as most relevant to the research question.

Chapter 5 – Analysis

This chapter contains the analysis of the business case, and seeks to answer the research question.

Chapter 6 – Conclusion

This section contains a summary of the analysis, briefly mentioning the important arguments. Recommendations for improvement of the business model and the commercialization process are also proposed at the end of the chapter, as well as implications for business model theory and some suggestions for further research.

2. Methodology

2.1 Research Approach

This research is following an inductive approach, which goes from data to theory. This approach is common when there is little pre-existing research conducted on a topic (Olsen, 2013a). First, the term "business model" has only been explicitly known during the last decade or so, and the business model concept lacks an established theoretical foundation within economics and business (Teece, 2010). And most importantly; the business model concept specifically used in the commercialization of petroleum technology appears to be relatively untouched. Therefore, an inductive approach seems appropriate.

With an inductive approach, the research begins with data collection – usually qualitative data gained through interviews. The data collected is then used to gain insight and identify patterns that can enhance our understanding of the topic. I tried to gain insight and understanding of EMGS's business model and how it has been employed to profitably commercialize the marine CSEM technology during the years. General economic theory and literature helped identify concepts and ideas that seemed particularly interesting to explore in the research process.

2.2 Research Design

The characteristics of this study's research design are exploratory. This is suitable for the purpose of gaining insight and understanding on a specific topic. An explorative design is very flexible and adaptable to changes throughout the study (Saunders, Lewis & Thornhill, 2012). One must be prepared to change direction once new insight is gained. It is therefore common to start with a widely defined focus, which is then narrowed during the research process. The initial wide focus and flexibility was valuable for this study since there were no clear preconceived expectations about findings regarding EMGS's business model and the commercialization process. The term "business model" is defined broadly, and can comprise a wide amount of factors. To identify the specific factors characterizing EMGS's business model and being relevant to commercialization of the technology, a wide initial focus was needed. As these specific factors were revealed throughout the research process, the focus

was narrowed. Additional follow-up questions in the interviews could then be specifically directed towards these factors.

The other elements included into this study's research design are the choices of research strategy, methodology and time horizon.

2.2.1 Research Strategy

This study is a single case study with the purpose of identifying the characteristics of the business model EMGS has been employing to commercialize their technology. EMGS can be viewed as an example of an *extreme* case, as few businesses experience this kind of growth during its first years. A *single* case study was chosen because of interest in this particular case and wanting to gain a rich understanding of the situation. Still, comparisons are an essential part of any case study (Olsen, 2013b). Instead of comparing several cases, which would have been difficult to achieve in this short period of time; I focused on comparing the interviewees' thoughts and meanings with written documentation. I also compare early stages of EMGS's business model with later stages.

In a case study, the case is chosen for its unique characteristics and the findings are not representative. The point of interest is *this specific case,* and whether the findings can be generalized or not is irrelevant (Olsen, 2013b). The purpose of a case study is to gain in-depth understanding and insight into this particular case (Saunders et al., 2012). In this case study, the point of interest is EMGS's specific business model and its role in the commercialization process. The findings are not supposed to be generalized. However, a case study may serve as foundation for further research, which can lead to generalizable findings about business models and technology commercialization in the future.

2.2.2 Methodology

This study makes use of qualitative data collected through interviews and supported by written documentation. Studies with an inductive approach aim to gain in-depth understanding and identify patterns. These types of studies usually use qualitative data (Saunders et al., 2012). Qualitative data provides a more in-depth understanding than quantitative data, and facilitates a more solid foundation for understanding the characteristics' of EMGS's business model and its role in the commercialization process.

2.2.3 Time Horizon

Most masters' theses are cross-sectional studies, due to scarcity of time. There is rarely enough time for longitudinal studies (Saunders et al., 2012). The main interviews in relation to this thesis were conducted in October 2013, but certain clarifications and follow-up questions were asked later. It reflects the interviewees' opinions and thoughts in this specific situation at this specific time. Still, although the *data collection* was performed over a short time period, the study is aiming to show the development in the business model over time. In this respect, this is a longitudinal case study, as it compares early versions with later versions of EMGS's business model.

2.3 Data Collection

Primary data was collected through semi-structured interviews and supported by written documentation from for instance EMGS's website. Interview objects were chosen through non-probability sampling that is heterogeneous and purposive.

2.3.1 Sampling

With a non-probability sampling technique, the interview objects were particularly chosen because of their knowledge and capability to help answer the research question. The sample size in this type of sampling varies according to research question and research objective (Saunders et al., 2012). I made use of the "snowball"-method, which consisted of first talking to a key employee of EMGS; Terje Eidesmo, one of the founders and former CEO and Executive Vice President of the company. Eidesmo then directed me towards another employee capable of providing more details and further elaboration; Valente Ricoy, geologist and project leader for EMGS's contract with Pemex. Both have consented on the publishing of names. In general, semi-structured interviews should preferably have a sample-size between 5 and 25 (Saunders et al., 2012). However, the chosen two interview objects turned out to have extensive knowledge regarding the research question, and I was allowed to perform several rounds of interviews to gain further insight. Combined with large amounts of written documentation available to verify the interviewees' responses, it seemed unnecessary to interview more candidates.

2.3.2 Semi-Structured Interviews

Semi-structured interviews provide the researcher with flexibility, as the interviews consist of both structured and unstructured sections (Saunders et al., 2012). Before conducting the interviews, an interview guide was prepared. The guide consisted of around 15 questions focused in the areas of value creation, value delivery and value capture. The interview guide was sent to the respondents before the conduction of the interviews. Before the preparation of the interview guide, I had already read through large amounts of documents and press releases. These sources were from EMGS's website and general information about the oil industry. The information served as a foundation for preparing the interview questions and choosing what was most relevant to ask. It also gave the study credibility by showing the respondents that I possessed knowledge and information about their business and industry prior to conducting any interviews.

In semi-structured interviews, the researcher has a list of topics and key questions to cover, but is allowed to move away from the interview guide, add new questions and leave out previously formed questions (Saunders et al., 2012). This flexible approach proved valuable, as I was able to ask the respondent to elaborate further and build on their responses when necessary. This approach also enabled me to identify concepts I did not consider when preparing the interview guide. The interviewees could then explain these concepts more thoroughly during the interviews. The semi-structured interviews provided me with insight and in-depth understanding about EMGS's business model and its role in the commercialization process. The questions asked were open, facilitating longer and extensive answers. The interview guide is attached in Appendix 1. Note that prior to the formal interviews I had studied written information concerning EMGS and its technology. I had also had informal phone conversations with EMGS representatives. The questions in the interview guide are therefore specified towards the areas in advance revealed as most interesting and crucial. Note also that the interview guide is in Norwegian.

Due to geographical distances, the interviews were conducted one-on-one via Skype. The interviews were audio-recorded, with the consent of the respondents.

2.3.3 Written Documents

As mentioned above, secondary data such as press releases, technical publications and presentations were extensively collected during the research process. In the beginning of the case study, secondary data served as preparation for interviews and provided a foundation for the interview guide. Later, it served as verification for the data collected through interviews, as well as providing additional data. EMGS possess a large library of publications and press releases available through their website.

2.4 Data Analysis

First, the audio-recorded interviews were transcribed. Transcribing the interviews allowed me to become familiar with the data collected, gain an overview and help start the thought process. Next, a so-called "template analysis" was conducted. After having read through the text a few times and established an insight into the data and material, the process of finding meaning in the transcribed texts started. Many researchers use software programs like Atlas.ti for the coding process. I preferred to conduct the coding process "manually". I went through the text adding different codes, for example "integration", to identify every time the importance of integrating different types of data was mentioned. This process made it easier to organize data and observe common patterns. I went through the codes, reducing any overlapping information and focused on the codes most relevant and central to the research question. A range of themes were identified. For example, the importance of data integration to create value, the financial crises affecting EMGS's ability to deliver value and oil companies being tough negotiating partners hindering value capture. These themes and the coding process contributed to understanding the characteristics of EMGS's business model and the commercialization process.

2.5 Evaluation of Research

When evaluating the research, I will look at ethical issues of reliability, validity and interviewer/interview bias.

2.5.1 Reliability

Reliability in general addresses whether the results of a study would be consistent if the study was performed at another time (Saunders et al., 2012). However, this is not relevant in a case study, as it is not meant to be repeated. The case study shows the results at the time when the case study was performed. The same study conducted by different researchers at a different point of time may generate different results. Reliability in a case study is to a larger degree based upon other researchers agreeing that the conclusions and results make sense based upon the data collected (Saunders et al., 2012).

2.5.2 Validity and Generalizability

External validity concerning generalizability is not relevant to a case study. Case studies are not meant to generate representative findings. However, as mentioned earlier, a case study can provide foundation for further research that may be able to be generalized. The validity of qualitative interviews is based upon how well the researcher is able to understand what the respondent really means (Saunders et al., 2012). Validity was accomplished through follow-up questions, clarification of questions, probing of meanings or rephrasing of answers when necessary. The fact that several interviews were conducted with the same people helped reduce the risk of misunderstandings. I was able to repeat questions again and clarify anything that might be unclear. Also, I tried to support as much as possible with written documentation.

2.5.3 Interviewer/Interviewee Bias

Interviewer bias is when the appearance or behaviour of the interviewer may affect the interviewees' responses. Interviewee bias concerns interviewees attempting to present themselves in a certain way that may not reflect reality (Saunders et al., 2012). Interviewees may be inclined to only discuss the successes related to the business model and the commercialization, and avoid negative topics. However, my impressions throughout the interview sessions were that honest and uninfluenced answers were given. Negative and positive topics were discussed during interview sessions. Still, to avoid any kind of biases, it is always important to focus on your own behaviour as a researcher by avoiding negativity and asking questions in an objective way (Saunders et al., 2012).

2.5.4 Ethical Considerations

To act ethically while conducting research, it is important to assess every stage of the research process from an ethical point of view. The study should not expose those being researched to any sort of embarrassment, pain or other significant inconveniences (Saunders et al., 2012). The interviewees have been informed about the study and what the data will be used for so that they can make a fully informed decision regarding their participation. All secondary sources of information are listed. I have also informed the interviewees about their right to anonymity if this is preferred. However, the interviewees consented on being mentioned by name.

3. Frameworks

3.1 Business Models

3.1.1 What is a Business Model?

There is no universally accepted definition of what a business model is. Most definitions consist of a list of elements that should be embedded in a business model. However, in spite of the poor defining; there is great value in establishing the concept within a set of circumstances, like the commercialization of a certain technology in an industry (Corkindale, 2008). A business model performs three essential functions: value creation, value delivery and value capture (H. Chesbrough, 2007). This useful framework links technical decisions to economic outcomes and converts technical potential into economic value (Corkindale, 2008). A start-up company will always need an appropriate business model in order to capture value from an innovation. Every innovation should therefore be combined with the development of a business model that addresses its "go-to-market" strategies and "value capturing" strategies. Without a good business model, companies will most likely either fail to deliver or to capture value from their innovations (Teece, 2010).

A business model reflects company management's thoughts about what customers want, the way they want it, how the company can meet those needs, receive payment and make profits. Knowing how to deliver value to the customer and capturing value is the key part in designing a good business model. The business model is about the advantages a company is able to deliver to customers, how it will organize to do so, and how it will capture parts of that value (Teece, 2010).

3.1.2 Theoretical Foundation

Little attention is paid to the topic of business models in the economic literature. The business model concept lacks a theoretical foundation within economic theory. In standard economic theory, the issue of capturing value is ignored; markets will solve the problems that – in reality – business models are created to solve. In mainstream approaches, it is often assumed that inventions create value naturally. Then, companies can capture value by simply selling the invention in established markets – and established markets exist for all

inventions. Because of this, there is no emphasis on business design. As long as a product delivers value, consumers are willing to pay for it. The market and the price system solve everything and business design is not considered as a relevant factor. However, in reality, there is not perfect competition. There are no pre-existing markets for all inventions. Customers don't just want products; they want solutions to their needs. This is particularly true for EMGS, as customers have proven to be unwilling to buy their products without extra service that turns it into a solution. Therefore – in reality – companies must pay close attention to business model design (Teece, 2010).

3.1.3 Business Models to Capture Value from Innovative New Technology

It is clear that technological innovation in itself does not guarantee economic success. Studies show that innovation without a proper commercialization strategy rarely leads to commercial success. Getting both the business model and technology strategy right is necessary for sustainable competitive advantage to be achieved and innovators to profit from their innovations (Teece, 2010).

Theory lists six functions of a business model that are relevant to any organization seeking to commercialize new technology (Chesbrough & Rosenbloom, 2002):

- Articulate the *value proposition*; the value created for users by the product or service containing the new technology.
- Identify the *market segment*; the users to whom the technology is useful for and for what purpose it is useful.
- Define the *value chain* that is necessary to create and distribute the offering, and decide the complementary assets needed to secure the firm's position in this value chain. Which complementary processes, organizations and assets are needed to ensure the ability of technology to get to the market and stay there?
- Estimate the *revenue generating mechanisms,* including cost structure and profit potential from delivering the technology, given the chosen value proposition and value chain structure.
- Describe the firm's position within the *business ecosystem*, consisting of suppliers and customers, potential competitors, competitors and substitutes.

- Formulate the *competitive strategy* that will enable the firm to gain and hold advantage over rivals.

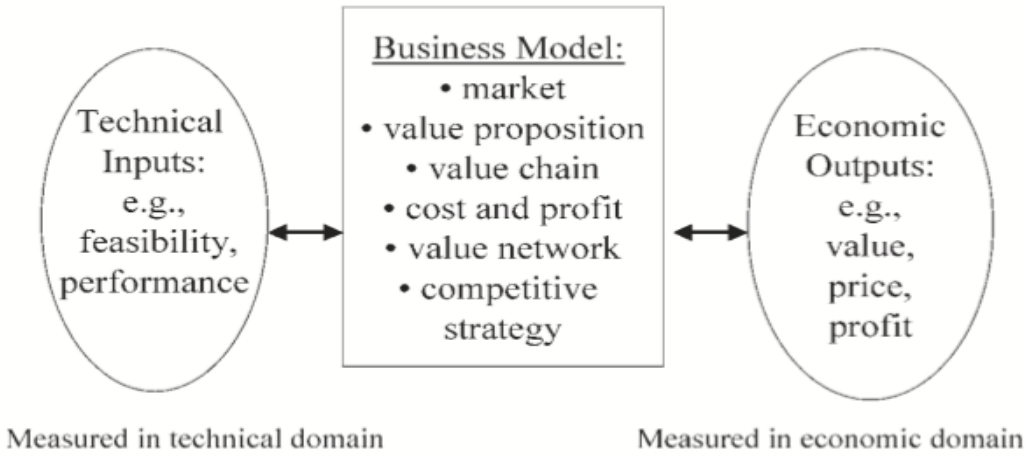

Figure 1: The business model mediates between the technical and economic domains (Chesbrough & Rosenbloom, 2002)

3.1.4 Business Model vs. Business Strategy

A business model should not be confused with a business strategy. A business model is more generic than a business strategy because it is addressing the fundamental structure of a business (Teece, 2010). While business strategies are more concerned with competition and how to win customers, business models are more focused on the core structure and core logic that enables the company to create value for customers (Seddon & Lewis, 2003). Business models pay attention to creating value for the customer, delivering value and capturing a part of that value. Business strategies place an emphasis on the concept of value capture (Chesbrough & Rosenbloom, 2002). The two concepts are very interconnected, and formulating a competitive strategy is an essential part of designing a competitively sustainable business model (Teece, 2010). However, the two terms “business model” and “business strategy” are often poorly defined with much overlap in academic literature (Seddon & Lewis, 2003).

3.1.5 Learning and Adaptation

Business models must change over time and adapt to changing markets, technologies and legal structures. A provisional business model must be evaluated against the current state of the business environment and how the environment might evolve and change (Teece, 2010).

3.2 Value Creation

Choosing the specific type of value you wish to offer your customers – to have a distinctive value proposition - is an essential part of a business model. Michael Porter (as cited in Magretta, 2012) describes value proposition as the answer to three important questions:

- Which customers are you going to serve?
- Which needs are you going to meet?
- What relative price will provide acceptable value for customers and acceptable profitability for the firm?

These questions can be presented in the value proposition triangle (Porter, as cited in Magretta, 2012):

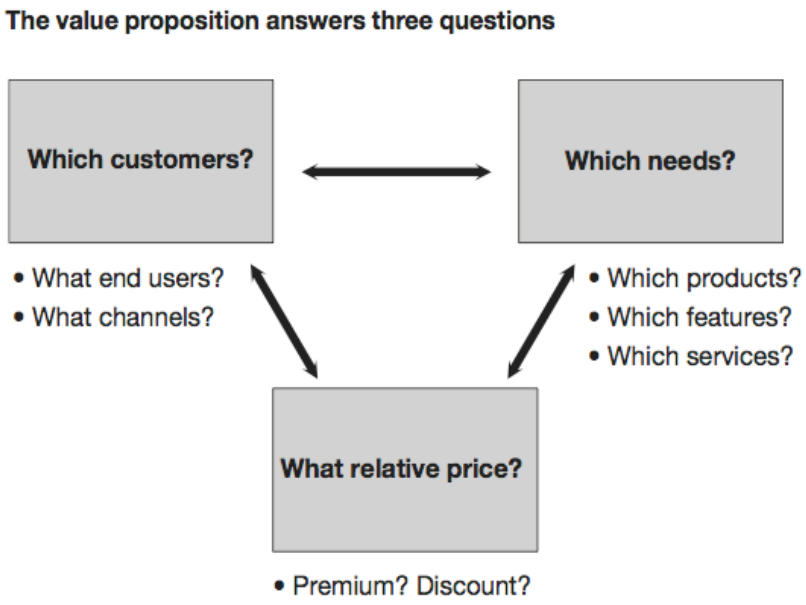

Figure 2: The value proposition triangle (Porters, as cited in Magretta, 2012)

3.2.1 Which Customers?

There are usually several customer segments within an industry. The firm's value proposition can be specifically targeted to serve one or more of these segments. For some value propositions, customer segmentation and choosing customers is the first important step. This decision then leads to the other two corners of the triangle, the assessment of needs and relative price. Customer segmentation is a vital part of every industry analysis. The choice of customers can play an important role in the firm's positioning against rivals, substitutes, potential entrants, suppliers and buyers. However, the essential part is finding a unique way to satisfy and serve the chosen customer segment in a profitable manner (Porter, as cited in Magretta, 2012).

3.2.2 Which Needs?

In several cases, choosing which needs the firm is going to serve is the first and foremost decision. This will then lead to the other two ends of the value proposition triangle. In these situations, the strategy is based upon a strong ability to satisfy particular needs. This ability to meet needs is often caused by specific characteristics of a product or service. Instead of segmenting customers based on demographic, geographical or psychographic features, the firm's customers will be defined by a common need at a given time. An example of a company focusing on serving a need is an American car rental company, Enterprise Rent-A-Car. While other car rental companies like Hertz and Avis focus on business travelers and vacationers, Enterprise is focusing on home-city car rentals. If your car is stolen or it has mechanical faults, you will most likely need a rental. These types of customers are often more price sensitive than business travelers. Enterprise has created a specific value proposition to satisfy those needs; low-priced convenient car rentals in the customers' home cities (Porter, as cited in Magretta, 2012).

3.2.3 What Relative Price?

For some value propositions, relative price is the most important corner of the above triangle. Some value propositions are aimed at serving customers already over-served by other offerings in the market. If these customers are over-served, they are also overpriced. A firm can gain customers through getting rid of all unnecessary costs and concentrate on

meeting the minimum – or "just enough" - of these customers' needs. An example of a company succeeding in gaining customers when needs are over-served is Southwest Airlines. The airline combines very low prices with very convenient service. Southwest Airlines has become the world's most successful airline by meeting "just enough" of its customers' needs at considerably lower prices. When customers are over-served, the lower relative price is usually at the dominant end of the value proposition triangle.

On the contrary, some value propositions are aimed at serving customers who are already under-served by offerings in the market. These customers will also be underpriced, and the firm can win customers through offering something extra and something special. An example of a company succeeding in winning customers when needs are under-served is the Danish audio manufacturer Bang & Olufsen. Many high-end audio manufacturers offer excellent sound quality, but Bang & Olufsen are very well known for their good design. The customers of this company request products that look as good as they sound. When customers are under-served, the unmet need is usually the dominant end of the value proposition triangle. The higher relative price helps cover the extra costs the firm experiences by trying to meet the need (Porter, as cited in Magretta, 2012).

3.2.4 Summary

In most industries, there are several possible arrangements of the value proposition triangle. Some firms may attend to all the customers in the market by meeting one specific need. Other firms choose to serve one customer segment and try to meet several of this customer segment's needs. Some firms offer high value at a high relative price; others offer a low relative price. However, if a company is serving the same customer segments as its competitors, as well as meeting the same needs and selling at the same relative price, then it has by Michael Porter's definition no strategy. The existence of a company's strategy is, according to Porter, dependent on a value proposition that is different from the value proposition of its rivals (Porter, as cited in Magretta, 2012).

3.3 Value Delivery

3.3.1 Porter's Value Chain

The term "value chain" was first developed by Michael Porter in his book "Competitive Advantage: Creating and Sustaining Superior performance" (1985). The value chain analysis describes the set of activities the company carries out, and connects these activities to the company's competitive positioning (MindTools, 2014).

A firm's value chain must be tailored to deliver the value proposition. If a value proposition can be delivered without a tailored value chain, it will not provide any sustainable competitive advantage. The set of activities – or value chain - organized to deliver the value proposition should be different from its competitors' activity sets. Porter states; "If that were not the case, every competitor could meet those same needs, and there would be nothing unique or valuable about the positioning" (Porter, as cited in Magretta, 2012, p.107). While value proposition focuses on customers and the demand, the value chain focuses on the internal operations and the supply. Strategy is integrating and bringing these two sides together (Porter, as cited in Magretta, 2012).

The value chain portrays the firm as a collection of value-creating activities. Porter distinguishes between two categories of activities; primary activities and support activities. Primary activities are directly involved with the transformation of inputs to outputs, the physical creation or delivery of a product or service. The primary activities can be divided into five main groups (MindTools, 2014):

1. **Inbound Logistics**: The processes and activities related to receiving, storing and distributing inputs and components used in the production process. The firm's supplier relationships are a key element here.
2. **Operations**: The transformation activities changing input into output – finished services and products - being sold to customers.
3. **Outbound logistics**: Activities related to delivering and distributing the product or service to the final customer.
4. **Marketing and sales**: The activities the firm performs to persuade customers to purchase from them and not from competitors.

5. **Service:** Activities associated with maintaining the value of the product or service to its customers, after it has been purchased.

Each of the primary activities is connected to support activities, which helps to improve its effectiveness and efficiency. The support activities' roles are to support the primary functions, and they can be divided into four main areas (MindTools, 2014):

1. **Procurement:** This involves acquiring the resources the firm needs to operate. Finding suppliers and negotiating prices are examples of activities.
2. **Technology Development:** Activities related to processing and managing information, as well as development and protection of the company's knowledge base.
3. **Human Resource Management:** Activities concerned with company recruitment, hiring, training, motivation, rewarding and retaining of workers.
4. **Firm Infrastructure:** The firm's support systems; the routines of the organization and the functions that allow the firm to maintain its daily operations.

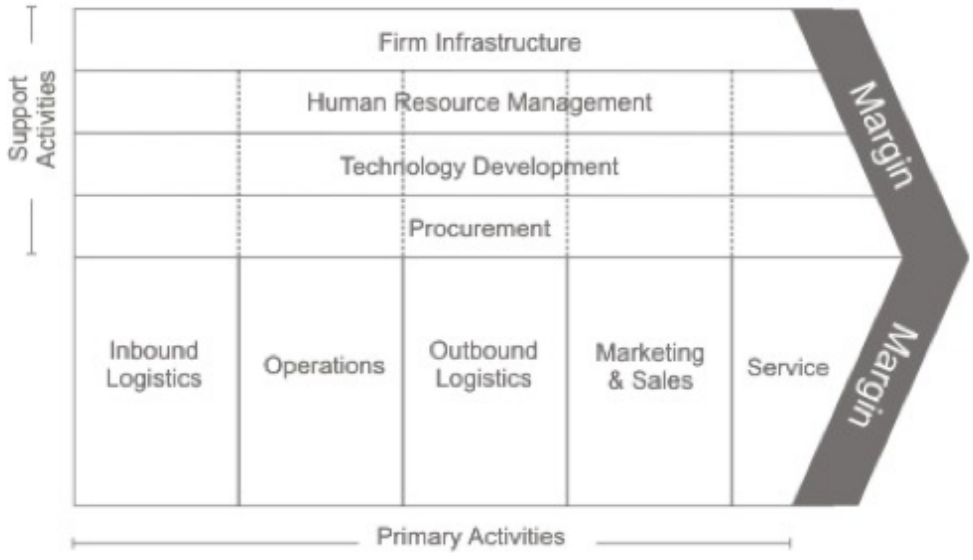

Figure 3: Porter's value chain (MindTools, 2014)

Michael Porter states that the very essence of strategy and competitive advantage lies in the *activities*. It is through *performing activities differently* from its competitors or through *performing different activities* from its competitors, that a company can obtain a competitive

advantage. The company should tailor its value chain to its value proposition (Porter, as cited in Magretta, 2012).

3.4 Value capture

When determining the share of profits captured by the innovator, the appropriability regime and the firm's positioning in the vertical supply chain are two important factors. The regime of appropriability refers to the environmental factors, separate from firm and market structures, which affect the innovating firm's ability to capture the profits from an innovation (Teece, 1986). It's the extent to which innovations and knowledge can be protected from imitators. The essential dimensions of an appropriability regime are the *nature* of the innovation itself and the *legal* mechanisms of protection (Hurmelinna & Puumalainen, 2005). The firm's position in the vertical supply chain is relevant in a *strategic* matter. Ideally, firms in an industry would prefer to capture all economic value. However, there are competitive forces working to transfer that value backwards to suppliers or forward to customers.

3.4.1 Natural

The nature of the core knowledge in an innovation, whether the knowledge is tacit or codified, affects how easy the innovation is to imitate. Codified knowledge, explicit knowledge that has been articulated, codified and stored, can easily be transmitted and received. This type of knowledge is therefore more prone to espionage from other firms. Tacit knowledge is hard to articulate, it's implicit and idiosyncratic, and it's included in organizational routines and capabilities. Because of these characteristics, transfer of tacit knowledge will be difficult and tacitness is representing a barrier to imitation in itself. For example, the tacit element in core technological know-how makes technology transfer very difficult. However, tacit knowledge needs to be protected, as it can move from one firm to another through the transfer of important employees with critical skills (Teece, 1986).

3.4.2 Legal

One of the most studied aspects involved in the protection of innovations are referred to as intellectual property rights (IPRs). Patents, copyrights, trade secrets and trademarks are

examples of intellectual property rights that provide protection for innovations. On many occasions, they will overlap. For example, trademarks can be combined with patents in an effective manner, as many examples of brand significance show. When a patent has expired, the trademark can protect and preserve the innovation's image to such an extent that it represents a barrier to imitation (Hurmelinna & Puumalainen, 2005).

However, it is a well-known fact that patents do not work in reality as well as in theory. Several patents can be "invented around" at low costs. Simple mechanical innovations and chemical products may experience significant protection from patents, while smaller process innovations usually experience very little protection. One reason for patents offering little protection is the steep legal requirements needed to maintain the patent's validity or to prove that the patent has been violated. Trade secrets, information valuable to the firm and unknown to the public, can serve as a possible alternative to patents in some industries. However, protection through trade secrets is only possible if a firm can offer its product in the market and still keep the underlying technology a secret (Teece, 1986).

IPRs like patents, trademarks and trade secrets is one type of institutional protection. The formal meaning of institutional protection is, "protection offered by the society to the innovator" (Hurmelinna & Puumalainen, 2005). But there are other types of institutional protection or legal mechanisms working to protect innovations; legally binding contracts is one example. Through contracts it is possible to introduce arrangements that are similar to the exclusive rights achieved through IPRs. Codified knowledge, which is normally hard to protect, can be protected by the use of non-disclosure agreements (Hurmelinna & Puumalainen, 2005).

3.4.3 Strategic

The Porter five forces framework portrays the profitability of an industry as a result of five competitive forces. These five forces of competition consist of three "horizontal" forces: competition from existing rivals, potential entrants and substitutes; and two "vertical" forces; the power of suppliers and the power of buyers. Here, the horizontal forces are already covered through other sections of theory. I will focus on the vertical forces; the firm's positioning in the vertical supply chain.

The firm in an industry competes in two different markets; the market for input and the market for output. In the latter, the company sells their products or services to customers. In the input market, the company purchases the goods and services it needs to operate, such as raw materials, components and legal services. In both the input and output market, value is created. How this value is distributed between the buyer and seller, defined by profitability, depends on their relative bargaining power (Grant & Jordan, 2012).

In the output market, "our" firm is the seller and the customer is the buyer. The buyer's bargaining power refers to the capability of the customer to negotiate prices and terms that will steal profits from the seller. The bargaining power of the buyer will affect the seller's profit potential. The more powerful a buyer is relative to a seller, the more influence the buyer will have. The buyer can pressure the seller to set lower prices, negotiate convenient terms and conditions and convince the seller to increase favors in customer services. There are several factors affecting the buyer's relative bargaining power (Grant & Jordan, 2012):

- The size and concentration of buyers relative to suppliers - if there are only a few buyers in the market, the seller's cost of losing one is greater, and the buyer will therefore have more leverage.
- Buyer's ability to integrate vertically – if the buyer can easily integrate backwards, or produce the seller's product himself, his bargaining power is strong.
- Buyer's information – the more informed the buyer is about the seller's prices and costs, the more he is able to bargain.
- The amount of output the buyer purchases from the seller
- The differentiation of the product/service
- The buyer's switching cost
- The availability of substitutes
- Buyer's price sensitivity

In the input market, "our" firm is the buyer and the supplier is the seller. The supplier's bargaining power refers to the capability of the supplier to negotiate prices and terms that will steal profits from the buyer. The analysis of the supplier's bargaining power is comparable to the analysis above, and the same factors affect the relative supplier power. The only difference is that it is now the firms in the industry that are the buyers and the producers of input that are the sellers (Grant & Jordan, 2012).

4. Empirical Data[1]

4.1 Key Facts About EMGS

EMGS were established on February 1st 2002 in order to commercialize a new technology. The founders were Terje Eidesmo, Ståle Johansen and Svein Ellingsrud, then working as researchers for Norwegian oil and gas company Statoil (EMGS, 2014b). During the previous five years, the founders had developed, researched and tested the hypotheses that electromagnetic energy could be used to detect hydrocarbons beneath the seabed and therefore be useful in the search for oil and gas (EMGS, 2014b). This concept was first tested in 1998, through the use of a strong electromagnetic source and several seabed receivers. By measuring the refracted energy from subsurface layers, the founders were capable of identifying zones with particularly high electrical resistivity (EMGS, 2014b). High electrical resistivity is a characteristic of hydrocarbon reservoirs (Eidesmo et al., 2002). The trial process continued for the next five years, ranging from small-scale tank tests to full-scale offshore surveys, and the concept was proven to be successful (EMGS, 2014b).

Statoil Innovation, with inventors Eidesmo, Ellingsrud and Johansen in the lead, established the subsidiary company EMGS in 2002. The purpose was to commercialize what has become known as Seabed Logging – SBL, or marine Controlled Source Electro-Magnetics - CSEM (Statoil, 2004). Statoil was the major shareholder in EMGS the first two years of its existence, but sold its 90 % share to the global private equity firm Warburg Pincus in 2004. The remaining 10 % were shared between two of the inventors, Eidesmo and Ellingsrud, and a group of employees (Statoil, 2004). EMGS were listed on the Oslo Stock Exchange in March 2007 valued at approximately 10 billion NOK (Warburg Pincus, 2007). Warburg Pincus remained the largest shareholder immediately after the IPO, but their share declined over the next few years, and they sold their remaining shares in March 2012 (TDN Finans, 2012).

[1] Large parts of the empirical data are collected through interviews with key representatives of EMGS; Valente Ricoy and Terje Eidesmo. The main interviews took place in October 2013. Sections containing information from the interviews have been cited as ”personal communication” throughout the text. However, due to readability, I have tried to limit the number of ”personal communication” citations to one or two per subheading.

When the financial crisis hit the oil industry in 2008, EMGS were hit very hard. According to their own Chairman of Board, Bjarte Bruheim, the company was close to bankruptcy in April 2009. Revenues decreased by 87 % in the first quarter of 2009, representing a loss of 160 million NOK. EMGS were forced to make a 40-percent staff cut in order to reduce the deficit (DN.no, 2009). By the end of April, the situation hit rock bottom. The date was set in Trondheim Probate Court for when to notify Oslo Stock Exchange and file a petition for bankruptcy. At the last minute, the Dutch multinational company Fugro decided to offer EMGS a convertible loan of 27 million USD. EMGS were saved at last hour, and the loan enabled them to continue their business and reach the success they are experiencing today (DN.no, 2009).

In 2010, EMGS were awarded a contract for several years by the Mexican petroleum giant Pemex, one of the world's largest oil companies. The contract represented the largest marine CSEM contract ever signed (EMGS, 2010), and was extended even further in 2012. The contract with Pemex was seen as a milestone in EMGS's existence, as it would most likely lead to increased interest and accelerated use of marine CSEM by other big oil companies (Aakvik, 2010). In 2010, EMGS also started acquiring data in 3D, which is considered a huge improvement of the technology.

As of today, EMGS have more than 300 employees. Annual revenues have increased from approximately 20 million NOK in 2002 to 201 million USD in 2012 (EMGS ASA, 2013). The headquarters and research department is located in Trondheim, but the company has major offices in Oslo, Stavanger, Kuala Lumpur and Houston, as well as local offices in Villahermosa and Rio de Janeiro. Sales representatives are present at several locations across the globe. Since its founding in 2002, EMGS have performed more than 700 surveys, become the market leader within the area of CSEM, and trained the world's leading offshore CSEM experts (EMGS, 2014b).

4.2 Value Creation

Reserve estimation and probability of success are key parameters when an oil company is evaluating different prospects. By integrating CSEM data in the evaluation process, the uncertainty of both these parameters is reduced. CSEM data reduces the uncertainty in risk and reserve estimates, and can highlight positive prospects as well as disqualify negative

prospects. If an oil company is able to avoid CSEM's negative prospects and focus on CSEM's positive prospects, it can achieve a competitive advantage and significantly reduce finding costs (EMGS, 2013a). While seismic data provides information on acoustic impedance contrasts in the subsurface, marine CSEM data gives information about the resistivity contrasts (Stefatos, Boulaenko & Hesthammer, 2009). High resistivity in an area can potentially indicate hydrocarbon accumulations (Anderson & Hedvall, 2010). Marine CSEM is a useful complementary technique for seismic surveying, which is the oil industry's no. 1 exploration method. Seismic data is highly valuable, but it also has its drawbacks. This type of data can detect structures that might contain hydrocarbons, but it is basically blind to the fluids in the formation. Marine CSEM, on the other hand, is responding to the fluids contained in the rock, and can highlight and disqualify the different prospects picked out through the seismic surveys (Scandinavian Oil & Gas Magazine, 2007). It is a valuable addition to the oil and gas exploration toolkit. However, it is important to note that marine CSEM technology has its limitations, like any other technology. It cannot be used in every environment and it cannot be used at any depth. If these boundaries are pushed, the surveys will most likely not be a success. Still, if the technology is used in a proper way within its limitations, it is a powerful method capable of providing high value to its users (V. Ricoy, personal communication, October, 2013).

4.2.1. The Technology

Marine CSEM is applied to the problem of detecting and characterizing hydrocarbon bearing reservoirs in deep-water areas. The term CSEM covers all forms for geophysical, electromagnetic surveys with an active source. The CSEM technique when used offshore is called marine CSEM (EMGS, 2014c). In marine CSEM surveying, a powerful horizontal dipole is towed along a towline at a constant depth about 30 meters above the seabed. The dipole source transfers a low-frequency electromagnetic signal both into the water body and downwards into the seabed (EMGS, 2014a). A series of electric and magnetic dipole field receivers are directly located on the seafloor, measuring the amplitude of the received signals, which depends on the resistivity beneath the seafloor. These receivers will be placed along the towline in a 2D study and in a grid in a 3D study. Since hydrocarbon-containing layers are highly resistive compared to surrounding layers, a CSEM survey can therefore identify the presence of oil or gas beneath the seabed. Mud and rocks usually dominate the subsurface formations in deep-water areas, with rather low resistivity. An area bearing

hydrocarbons may have 10-100 times higher resistivity (Eidesmo et al., 2002). Electromagnetic energy is attenuated fast in electrically conductive formations, but attenuates less and propagates faster in formations of higher resistivity, such as reservoirs filled with hydrocarbons. The data from the survey is processed, inversed and interpreted. The resulting datasets, combined with other subsea information, will allow oil companies to become capable of making important drilling decisions with a greater sense of security (EMGS, 2014a).

The sensitivity of EMGS's field receivers located on the seafloor enables the company to also acquire Magnetotelluric (MT) data as part of a CSEM survey. MT surveys are mapping subsurface resistivity by measuring naturally occurring electrical and magnetic fields on the seafloor. MT surveying is a useful complementary technique, as it is able to penetrate thicker resistive layers that would have been challenging for CSEM and seismic techniques (EMGS, 2014a).

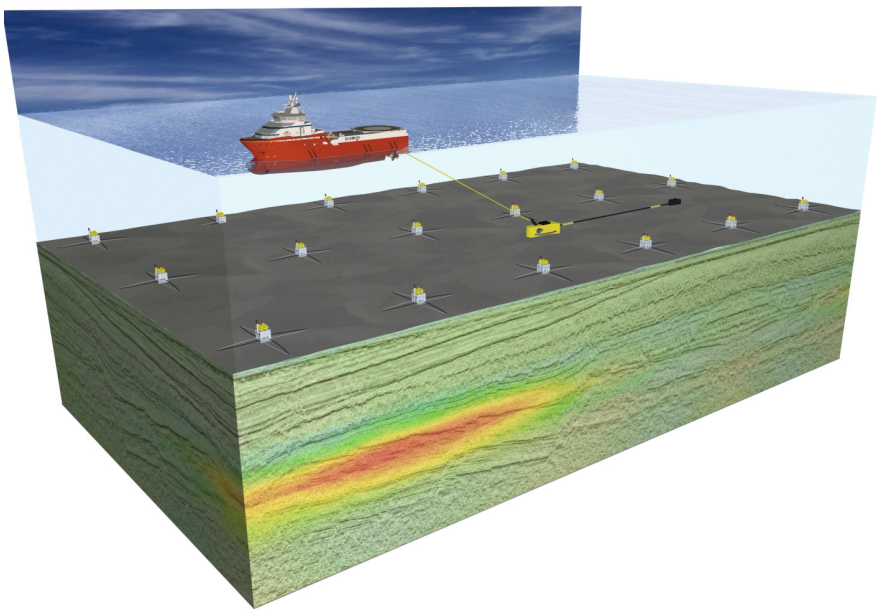

Figure 4: Illustration of a CSEM survey. A horizontal dipole is towed above receivers located on the seafloor. The dipole transmits an electromagnetic signal, which is recorded by the receivers. The same receivers can also be used for measuring MT data (EMGS, 2014d).

4.2.2 Sources and Receivers

The controllable EM sources used by EMGS are considered the most powerful in the industry. These sources are able to operate continuously for long periods of time and do not affect the marine life or environment. The frequency of the electromagnetic signals being transferred is customized for each survey. The sources can reach hydrocarbons through more than 3 km of rock and at sea depths down to 3.5 km. These sources are custom-built by the German company Siemens, but EMGS have provided input in the development process (EMGS, 2014k).

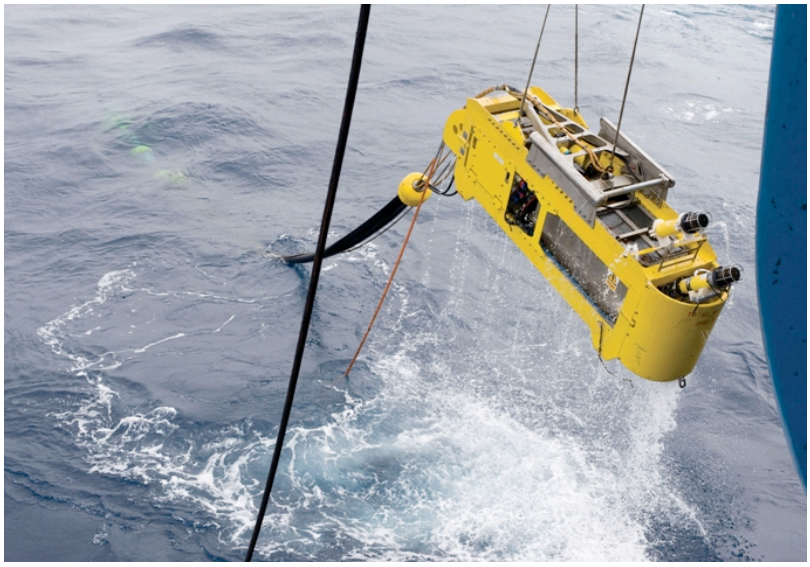

Figure 5: One of EMGS's high power sources (EMGS, 2014d)

EMGS's receivers are capable of measuring signals with large variations in magnitude, from the weak MT signals to the stronger CSEM signals. The receivers are highly sensitive, and enable EMGS to indicate hydrocarbons in many diverse types of environments. To ensure fast placement and accurate seafloor positioning, the receivers are designed to sink rapidly. The receivers can remain autonomous for several weeks and because they have a long battery life and a large-capacity memory, large and long-lasting surveys can be performed (EMGS, 2014j).

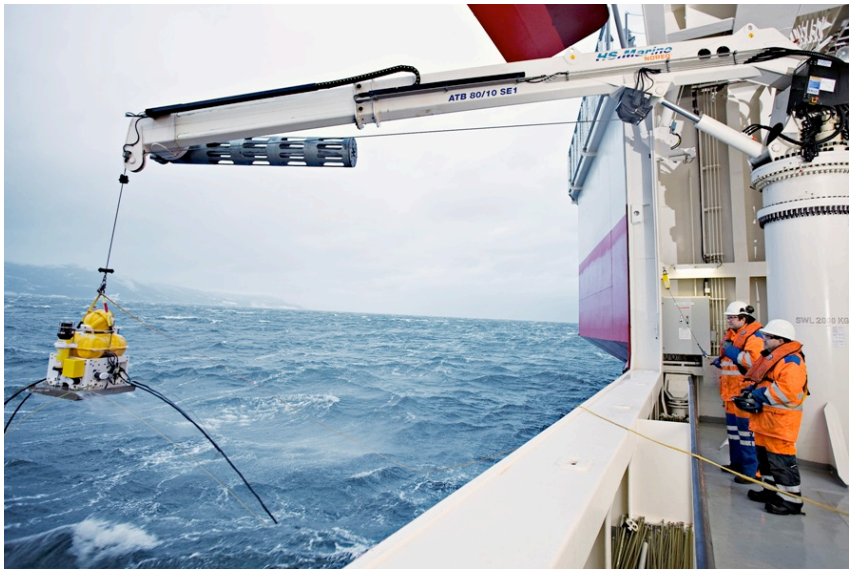

Figure 2: A receiver being deployed from the vessel by one of EMGS's specialist crane operators (EMGS, 2014d).

4.2.3. Services

EMGS offer several services as part of marine CSEM surveying; data acquisition, data modeling, data processing, as well as integration and interpretation.

4.2.3.1 Data Acquisition

Data acquisition is the actual survey, the use of survey vessels, dipole sources and seafloor receivers to acquire geophysical data. The vessels are capable of handling several receivers efficiently at the same time, and this enables EMGS to use large amounts of receivers in their surveys. This way, they are also able to acquire large amounts of detailed 3D data (EMGS, 2014f). In the beginning, EMGS acquired data in a 2D format. However, since 2010, acquisition of 3D data has become the standard practice within marine CSEM surveying. 3D methods have several significant advantages over 2D methods. First, 3D methods are able to acquire data from every direction. Full-azimuth 3D EM data acquisition, which the method is called, leads to a reduced risk of missing smaller targets, increased data coverage and density, and better spatial and depth resolution. It also provides datasets suitable for efficient integration with other datasets (EMGS, 2014g).

4.2.3.2 Data Modeling

Data modeling is relevant in several parts of EMGS's operation, specifically in the planning and interpretation phase of a survey. In the planning phase, before a survey is conducted, EMGS use simple models to investigate whether a CSEM survey is likely to be a success in that exact geological setting. If this sensitivity study provides a positive answer, they may continue to develop more detailed, advanced and realistic 3D resistivity models. These 3D resistivity models are used to conduct virtual surveys further on in the planning phase. The virtual surveys help to ensure the best possible design of the real survey, and enable EMGS to acquire more precise and accurate information out at sea. In the interpretation phase, 3D resistivity models are used for hypotheses testing. For example, 3D resistivity models can be used to test the solidness of the inversion results after the data inversion (EMGS, 2014h).

4.2.3.3 Data Processing and Inversion

Data processing is the preparation of data for inversion, which is a mathematical process using data to create a model that fits that exact data. The data processing begins with the raw data from the seafloor receivers being reshaped into more generic electromagnetic field data. Inversion is then used to convert this electromagnetic data into a resistivity model (EMGS, 2014c).

EMGS processes data both offshore and onshore. The offshore processing, also called on-board processing, is performed to make sure the quality of the data is optimal. It also shows whether the datasets acquired are comprehensive enough. EMGS can also determine if a survey should be extended or not, while the survey vessel is still out at sea. The onshore processing and inversion involves deep-conversion of electromagnetic data into resistivity values (EMGS, 2014i). One distinguishes between 2,5D inversion, which is a simplified method where resistivity is considered constant in one dimension, and 3D inversion, where the resistivity can vary in all directions. 2,5D inversion is a rapid method compared to the comprehensive 3D method, and allows you to quickly obtain a simpler resistivity model for the early interpretation of electromagnetic data (EMGS, 2014c).

4.2.3.4 Integration and Interpretation

Integration of different datasets is an essential element of the interpretation process. Although EMGS is only acquiring CSEM and MT data, the company has the expertise to integrate CSEM, seismic, magnetotelluric, well log, and other datasets. For example, EMGS

may compare seismic and CSEM data, to see if it develops the same conclusions. Adding electromagnetic data to seismic data can in some cases identify interesting areas that may have been overlooked without the electromagnetic data. Using CSEM data with seismic and geological information improves the understanding of the subsurface, by shortening the list of possible geological scenarios (EMGS, 2013a). The integration of various datasets makes the information more accurate, valid and precise; easing the oil companies' decision-making process.

EMGS's initial idea was to hand the processed data over to the oil companies, who would perform the interpretation and integration themselves. However, over the years, EMGS have learned that the oil companies lack the expertise and experience needed to make use of and integrate CSEM data. EMGS have therefore hired professionals with data integration competence, to support the oil companies during the interpretation process (T. Eidesmo, personal communication, October, 2013).

4.2.4 Interaction with Oil Companies

For EMGS to create value for its customers, the CSEM survey needs to provide accurate, precise and correct information. This information represents valuable input to the oil companies' decision-making process for exploration activities, reducing risk and economic uncertainty (Stefatos, Boulaenko & Hesthammer, 2009). To achieve this kind of accurate information, correct interpretation of the CSEM data and integration with other datasets is essential. In that respect – the type of interaction EMGS have with its customers is crucial.

4.2.4.1 Integration of Datasets

For CSEM data to provide value for the oil companies, it needs to be combined with other datasets. "The more data you have to combine it with, the better. There is no single tool that will resolve the problem" is stated by Valente Ricoy, project leader of EMGS's Pemex-contract (personal communication, October, 2013). CSEM data alone is valuable for reducing risk, but it is not *removing* risk by itself (Hesthammer et al., 2010). This data is a valuable tool for mapping seafloor resistivity, but the resistivity in itself is not a certain indicator of hydrocarbons. Integration with other geological and geophysical data sets is necessary (Constable, 2010). The most correct and precise decisions are made when EM data is combined with other types of data such as seismic data, MT data and well log data. Every

type of data has its advantages and disadvantages. Seismic data will normally have a higher resolution than CSEM data, while CSEM data reacts to higher hydrocarbon saturation levels than seismic data. Well log data does also have a high resolution, but this kind of data requires the drilling of expensive wells. By maximizing the use of different datasets, the decision-making process will be eased and the chances of detecting oil reservoirs will be improved (Stefatos et al., 2009).

It is important to note that the oil companies possess the most knowledge and data regarding their oilfields. "The oil companies possess the best overview of their data. When assessing a possible oilfield, they usually have a lot of information about nearby oilfields, the geology of the area, etc. They also possess the seismic data, which is necessary to make an interpretation as accurate as possible. And then you have our data, which is another tool in the toolbox that allows you to get even more information about the area (…)", says Terje Eidesmo (personal communication, October, 2013). However, many oil companies have been unwilling to share sensitive information about other datasets (Stefatos et al., 2009). This has proven to be an issue for EMGS, as CSEM data will not provide accurate information without being combined with other types of data.

4.2.4.2 Oil Companies Lack Expertise within CSEM

When the CSEM technology was introduced in 2002, it was marketed as a technology capable of detecting hydrocarbons with very high accuracy, before having to drill wells. However, experience has proven that a good analysis of CSEM is a complex process that requires in-depth knowledge, access to other datasets and tools for processing, modeling and inversion (Stefatos et al., 2009). To change the acquired raw data into resistivity images ready for interpretation, sophisticated modeling and inversion is required (Constable, 2010).

Upon founding the company, EMGS's initial idea was that their area of focus would be data acquisition and data processing. "When first starting the company, we thought we could acquire and process the data, and then hand it over to the oil companies, who would continue the process themselves", says Eidesmo (personal communication, October, 2013). The oil companies would be handed the acquired and processed data, and would be responsible for analyzing, interpreting and integrating the data themselves. However, for EMGS, it has become obvious over the years that oil companies lack the experience and expertise needed to interpret and integrate CSEM data. The interpreters in the oil companies know little about

the marine CSEM technology, and there has been some misinformation and misinterpretation. “What we were struggling with the most, is that the guys that analyze the data – let’s call them interpreters - they don’t know much about what the technology is all about. There is a lot of misinformation”, says Valente Ricoy (personal communication, October, 2013). EMGS’s understanding of this fact has grown strongly over the last few years, and they have hired several professionals with integration skills, to support the oil companies in the interpretation phase. “(…) We have learned that we need more people with the experience of using other types of data, and especially seismic data”, says Ricoy.

4.2.4.3 Experience With Oil Companies

This unwillingness to share and be open about data, combined with the oil companies’ own lack of expertise within CSEM integration, has represented a big problem for EMGS. After becoming an initial success in the first 3-4 years, when the technology was new and the oil companies were curious to try it, it hit a downturn in 2008. The oil crisis, in combination with some unfortunate cases of data misinterpretation, slowed down EMGS’s success. For example, an independent Norwegian oil company who was originally a promoter of CSEM technology, experienced some unsuccessful CSEM surveys in this period. The company drilled a field in the area of West Africa that they thought was hydrocarbon related, as CSEM data showed very high resistivity. However, the field turned out to be a deposit layer made of carbonate, and not an oil reservoir. The company had forgotten to look at the big picture; if seismic data of the field’s surrounding areas had been taken into consideration, they would have discovered the carbonate shelf. This would have provided information about the highly resistive anomaly actually being an erosional byproduct of the carbonate shelf. This example shows the importance of gaining access to several types of data and applying integration in the interpretation process (V. Ricoy, personal communication, October, 2013).

4.2.4.4 Two Pathways to Success

There are two pathways to success for CSEM surveys; the oil company should either be really experienced in integrative interpretation themselves, or professionals from EMGS should go to the company and spend time with them. As previously mentioned, the first method seems hard to achieve today. The general majority of the oil companies lack expertise and knowledge about the CSEM technology, how it should be applied, and how data should be interpreted to bring success. The West Africa incident is an example of this.

In the latter method, the interpretation should be provided in close partnership with the client. The time spent with the company should preferably be for the whole length of the project; from the planning phase of a survey until the interpretation and integration phase is over. The team from EMGS should be experienced in integrating and interpreting different datasets, and they should collaborate closely with the company during the integrative interpretation. “If you were to ask me, the best situation would be to establish a group or team where EMGS people, experienced in interpreting and integration data, sits with the company”, says Ricoy (personal communication, October, 2013).

Either way, whether the oil company is capable of performing the interpretation alone or whether EMGS is supporting them, access to different types of data is a key prerequisite for the technology to create maximum value for the oil companies.

4.2.4.5 The Pemex-Contract

The multi-year contract EMGS secured with Mexican petroleum giant Pemex in 2010 was the largest marine CSEM contract ever signed. The contract was worth USD 150 million, and consisted of approximately 30 deep-water CSEM surveys in the Mexican area of the Gulf of Mexico (EMGS, 2010). The collaboration between EMGS and Pemex has proven to be a success. The contract was therefore extended in 2012, with additional USD 39 million. "This contract extension is an endorsement of our technology and the value that EM delivers in hydrocarbon exploration. Pemex and EMGS have worked closely over the course of the last two years, and we look forward to further developing this relationship and supporting Pemex in its efforts to improve Mexico's reserves replacement ratio," were the words of Roar Bekker, EMGS’s chief executive officer (EMGS, 2012).

The extension of the contract and the comment from Roar Bekker, indicate that the interaction between Pemex and EMGS may have been different than what has been common interaction with other oil companies. Pemex and EMGS have worked closely together over the contract period. Professionals from EMGS have been in touch with Pemex on a daily basis, and the CSEM surveys have been very successful in providing information for Pemex’s exploration. EMGS have offices in Villahermosa, where both technical and administrative employees are seated. Villahermosa is also where Pemex’ exploration office is located. EMGS and Pemex professionals have therefore been in a position to meet and correspond on a daily basis, and this lowers the requirements for Pemex’s own CSEM

competencies. The close collaboration and daily contact between EMGS and Pemex has proven to be the key factor for success, as long as the oil companies themselves lack the expertise to interpret and integrate data. “Pemex has been very open to share data for our analysis, as input to the analysis. That has been a really good thing, and made this a success versus a non-success”, is the comment from Pemex project leader Ricoy (personal communication, October, 2013). Pemex have been willing to share for instance seismic and well-log datasets as input to the CSEM analysis, a contrast to other oil companies’ secrecy. “If I were to compare this to other companies, they are in general very “jealous” of their data. We end up providing the CSEM data, maybe with some analysis, but we don’t have the seismic and other information to sort of really analyze the CSEM data. That is something we know, and I think the companies know it, but then again, we have hit the walls many times in that respect” (V. Ricoy, personal communication, October, 2013).

The Pemex-contract in 2010 and the extension of the contract in 2012 represent a milestone in the story of EMGS. This type of collaboration and interaction has proven to be a route to success. The use of CSEM surveys has created great value for Pemex; "We have over the last few years reinvigorated our exploration organization and embraced technologies that give us an advantage. This has resulted in a boost in our reserve replacement ratio and 3D EM data has been an important part of our recent exploration success″ are the words from PEMEX representatives (EMGS, 2013e). The close interaction, daily contact and openness about data appear to be central factors for this value creation, as it has enabled EMGS to provide as precise and correct information as possible.

4.2.4.6 Other Success Stories

The Pemex-model is in many ways considered a milestone, but EMGS have also experienced success in collaboration with other oil companies. For example, the Brazilian multinational energy company Petrobras, who EMGS signed a USD 90 million contract with in 2011 (EMGS, 2011b). Petrobras are moving in Pemex’s direction and are interested in closer collaboration and interaction with a slightly stricter regime. “It is slightly different with them, because data can not leave the Petrobras office. So we need to find people from EMGS who can go to Petrobras and sit in their office”, says Valente Ricoy (personal communication, October, 2013). With Pemex, the EMGS professionals were allowed to interpret and integrate the datasets at the EMGS offices in Villahermosa. Petrobras practices a more rigorous regime than Pemex.

EMGS have also conducted several successful surveys for Dutch petroleum giant Royal Dutch Shell over the last few years, primarily in Asia. In January 2014, it was revealed that EMGS had signed a global framework agreement with Shell for the delivery of various services. These services were survey planning and survey modeling, EM data processing, EM data inversion and integrated interpretation. The words from Friedrich Roth, EMGS's Vice President of Imaging & Integration are as follows; "We are very pleased to strengthen our service offering to Shell with this framework agreement. Shell is one of the most experienced users of EM technology and the agreement further endorses EMGS's capabilities in processing and interpretation of 3D EM data" (EMGS, 2014e). This framework agreement with Shell appears to be another large step in the right direction, as it seems to have a strong focus on the important data integration and interpretation process.

Another company, who EMGS *thinks* could benefit strongly from CSEM surveys is Norwegian national oil company Statoil - the initial parent company of EMGS; "(…) There is a lot of expertise on this technology within Statoil, so I think they could benefit very much from using the technology more", says Ricoy (personal communication, October, 2013). However, as of today, Statoil is not one of the most frequent users of CSEM surveys.

4.2.5 Pricing

EMGS are currently using cost-plus pricing. This is the practice of determining the cost of delivering a product, and then a certain percentage is added on top of the cost. "Value-based pricing, to get paid for the value you add to the company, is difficult to achieve," says Terje Eidesmo (personal communication, October, 2013). EMGS are using a general price list as a basis, and the final price depends on the exact assignment EMGS will perform and the outcome of negotiations. The general price list is based on the costs plus a markup.

EMGS also use "total entry pricing". This method ensures large profits if the operation goes well, medium profits is the operation is mediocre, and losses if the operation is a failure. This kind of pricing is also acceptable from the oil companies' point of view. If EMGS is doing a great job; they accept higher earnings for EMGS. If there is a lot of trouble, they know that EMGS carry most of the risk. Still, the basis for this kind of pricing is a cost-plus strategy.

An aspect related to the pricing is EMGS's multi-client program. The multi-client program is a way of earning more per survey than from direct contracts. The essence of the multi-client program is surveying of larger areas - like the Barents Sea - and then selling data about the area to several customers. The costs of surveying will usually be covered by one sale, and several sales will ensure high profits. As of 2012, EMGS had already covered 24.000 square kilometers in the Barents Sea. The plan for 2013 was to fill in and expand with additional 6-9000 square kilometers of CSEM data. This will lead to an extensive CSEM data library covering large parts of the Barents Sea (EMGS, 2013c).

4.3 Value Delivery

4.3.1 Do It Yourself vs. Outsourcing

EMGS's strategy since its founding have been to do everything related to their core business themselves and outsource the standard services. While most seismic companies own and operate vessels themselves, EMGS have focused on finding good partners; "For owning and operating vessels ourselves to be profitable, we would have to compete with the current vessel owners, who are the experts in this field. And that would not have been beneficial at all. Besides, vessel operation is not a core activity for us", are the words from founder Terje Eidesmo (personal communication, October, 2013). The four vessels used by EMGS today are hired through contracts with external shipping companies. There is a large international fleet of Norwegian and foreign supply vessels and seismic vessels available in the market (Ulset, 2007). EMGS is performing everything related to CSEM equipment, data acquisition and data processing, while the shipping company is responsible for the maritime operation of the vessel. Still, as the maritime crew of the vessel may have little to do during the survey itself, EMGS have an agreement that allows them to make us of the crew in certain operations. This way, they can reduce the number of people onboard.

When it comes to general equipment and handling equipment like cranes, lifts and winches, this is not a core activity either. This type of equipment is acquired from suppliers externally in the market, who have designed it for EMGS's use. Sometimes EMGS need a particular design and are therefore participating in the design process themselves.

The measuring equipment used in data acquisition is strongly related to EMGS's core business, and the company is in full charge of this core activity. This kind of equipment can be parted into two key elements; the source transferring electromagnetic signals, and the receivers conducting the actual measurements. The source itself is manufactured by the German engineering and electronics company Siemens. EMGS did initially have a fully exclusive agreement with Siemens; Siemens was only allowed to produce this source for EMGS and no one else. "Upon signing this agreement, we were only three people in the company. Siemens had no idea that this equipment would sell, and naturally we took advantage of that opportunity and landed an exclusive agreement", says Terje Eidesmo (personal communication, October, 2013). However, the agreement with Siemens has later been renegotiated. There is still an exclusivity agreement, but EMGS cannot approach any other suppliers regarding the source. If this latter term is violated, Siemens can freely sell this type of equipment to other customers. It is also important to note that Siemens are owners of the source technology parts they have developed. Still, EMGS appear to maintain a significant degree of control. A lot of knowledge and expertise from EMGS have been provided in the process of developing the source, and they are the owners of large parts of the technology (T. Eidesmo, personal communication, February, 2014).

The receivers are fully developed internally at EMGS; "There are of course standard elements being acquired from standard manufacturers, but these are individual items with a wide range of applications. The receiver itself is developed internally at EMGS, and we have full control over it. No one else can copy it, or purchase it for that matter", says Terje Eidesmo (personal communication, October, 2013).

Software is also fully developed internally at EMGS. Software development represents an important part of EMGS's core activities. This involves software related to modeling and processing, as well as software controlling the data acquisition. "There is a large group of professionals at EMGS constantly working to develop the software", says Eidesmo (personal communication, October, 2013).

4.3.2 The Oil Crisis in 2008

The bankruptcy of Lehman Brothers in 2008 and the following financial crisis also affected the oil companies. The year 2009 is said to represent one of the worst years in the oil industry (DN.no, 2009). The global financial recession led to a reduction in the demand for

oil and gas in the second part of 2008. This again, led to a drastic fall in the price of oil, from the top level of 147 USD per barrel during mid 2008 to under 40 USD per barrel during the start of 2009. The responses of the oil and gas industry were to cut costs, cut the budgets and postpone projects and contracts. The results of these actions were a reduction in worldwide exploration and production spending of about 15 % (Fugro, 2010). "The drop in the oil price happened in the middle of the oil companies' budget process", says Terje Eidesmo (personal communication, October, 2013). In spite of the oil companies not having any crucial liquidity problems, the fall in the oil price led to significant budget cuts. Terje Eidesmo recalls; "I remember having meetings with a company in Stavanger the fall 2008, in the middle of these budget cuts. The person I talked to informed us that they did not have any budgets ready, everything was delayed, they did not know what kind of budgets they would get. It was out of question to sign any new contracts and they did not know if they were capable of following through contracts that were already signed". And it happened; some oil companies cancelled contracts that were already signed and sealed. However, EMGS did not pursue legal actions against the companies, as that would preclude any future contracts with them.

Around 2008, EMGS had reached a point where they needed to convince not only the innovating personalities curious of new technology, but also the more pragmatic people responsible for long-term business decisions. In addition to this, there had also been some misinterpretation of CSEM surveys. Selling a fairly young technology was difficult in the first place, but it turned out to be considerably more difficult when the budgets of the oil companies were cut in 2008. Services of EMGS's type were the first to be removed from the budget when the global financial crisis started. This lead to a complete absence of contracts, and the year of 2009 turned into the biggest challenge so far for EMGS.

4.3.3 Fugro

EMGS were close to bankruptcy in April 2009, but were saved in a last-minute deal with the Dutch company Fugro, who offered EMGS a convertible loan of USD 27 million (DN.no, 2009). Fugro is a multinational company specializing in collecting, processing and interpreting geological data for the oil and gas industry (4-traders, 2014). "The contact with Fugro was initiated the fall of 2008. The initial thought was not for Fugro to invest in us; we were instead picturing an integration of our projects and products with seismology, and a

closer collaboration with a seismic company. We thought this would strengthen us and maybe improve our offering to the oil companies," says Terje Eidesmo (personal communication, October, 2013). Instead, Fugro turned out to be the one providing financial aid, when EMGS in 2009 experienced the repercussions of the oil companies' budget cuts. The idea of a closer collaboration with a seismic company did not turn out as planned, and at the end it was fair to say that the most important thing EMGS got out of the Fugro-alliance was the initial financial support; "which of course was important for us at that time" (T. Eidesmo, personal communication, October, 2013). In a press release from March 2010, Fugro mentions the cooperation agreement with EMGS (Fugro, 2010); "Fugro has gained full access to EMGS's marine EM methods for hydrocarbon exploration and production and EMGS will gain access to Fugro's worldwide marketing network and marine operations expertise." However, EMGS's impression of the situation was that Fugro exploited the collaborative situation a bit too early. Fugro mainly tried to strengthen their knowledge and expertise within CSEM, instead of cooperating with EMGS. "This led to a negative mood within EMGS, and getting the collaboration to work was a challenge. The collaboration did have many good intentions, but in the end there were too many individual interests present", says Eidesmo. Therefore, the alliance did not represent the success they were hoping for. The convertible loan from 2009 was converted into shares in 2011, but Fugro sold all of its financial investment in EMGS in 2012 (Fugro, 2012).

As of today, Fugro is providing land and marine electromagnetic services to the oil & gas industry through a separate entity, Fugro Electro Magnetic (Fugro Electro Magnetic, 2013b). EMGS's impression is that Fugro would have been better off financially by cooperating in a constructive manner. "(…) I think Fugro could have earned more through a collaboration, than through focusing on gaining CSEM information and competing with us", says Terje Eidesmo (personal communication, October, 2013). Nevertheless, although the cooperative agreement uncovered different interests, Fugro's financial investment in 2009 allowed EMGS to continue its operations and continue to deliver value to its customers.

4.3.4 The Effect of the Financial Crisis

The financial situation of EMGS in early 2009 gained interest in the Norwegian financial media; "One Hour From Bankruptcy!" and "Saved From Bankruptcy at Last Hour" are headlines from the press (DN.no 2009). It was a serious situation, but according to

representatives of EMGS the situation was to some degree blown out of proportion. Fugro's offering to help appeared at a very convenient time, but EMGS's impression is that other companies would have been willing to invest if Fugro had not shown interest. The global financial crisis and the following reduced spending in the oil and gas sector was definitely a challenge for EMGS. However, EMGS focused on spending this period without contracts, improving their technology; "Okay, we have a slack period here. Let us use this time to further improve our products, so that we return stronger than ever when the market functions better (…) We lost maybe a year time-wise, but I don't think it was worse than that", says Terje Eidesmo (personal communication, October, 2013). And EMGS did come back stronger after the crisis; signing the multi-year Pemex contract in 2010, and starting to acquire 3D data that same year, two milestones in the company's existence. The global financial crisis and resulting lack of contracts hindered EMGS's value delivery for a period, but at the same time the downtime enabled EMGS to strengthen their value creation.

4.3.5 Crossing the Chasm

For EMGS to deliver value, they will need to convince potential customers to buy their products and services. The first 3-4 years after the company's founding were quite successful. "Initially when it started, it was sold to many clients, and many perceived it as sort of a golden bullet. That it was going to solve problems", says Valente Ricoy (personal communication, October, 2013). In the early phases, when the marine CSEM technology was brand new, the oil companies were curious and wanted to test it. However, after a few years, EMGS reached a point where they had to "cross the chasm". "Crossing the Chasm" is a term used to describe the challenging strategic and marketing process that a technology startup has to go through. The process includes selling their products to innovators and early adopters in the first phase and selling it to the early majority or pragmatists in the next phase (startups.co, 2004-2006). EMGS went through the boom and bust of very enthusiastic early adopters, to where marine CSEM had to gain long-term acceptance and become an integrated part of the oil and gas exploration toolkit (Constable, 2010). "In the first phase, we met the technologists who love new technology and who are very eager to try new technology. In the next phase we need to develop the market, and also convince the more pragmatic professionals responsible for the business decisions, and that is a much harder job", says Terje Eidesmo (personal communication, October, 2013). In EMGS's case, the

crossing of the chasm coincided with the financial crisis, and this further amplified the difficulties.

EMGS were founded in 2002 as a subsidiary of Norwegian oil company Statoil, and the inventors originally worked as researchers for the same company. Statoil kept its role as major shareholder until 2004. Yet, although their innovation department was part of developing the technology and initiating the founding of EMGS, Statoil is not a major user of CSEM surveys today. "I think Statoil, before it was merged with Hydro, were really keen on the technology. But then, after the merger, there were people coming from Hydro that were not that keen on the technology. That really stopped activities of electromagnetics within Statoil, and of course that hit the relationship with us. However, I think they are coming back slowly. That's what the rumors are", says Valente Ricoy (personal communication, October, 2013). It is possible that Statoil, playing a major role in the initial development of the technology, also possess more knowledge and expertise than many other oil companies. Statoil could benefit from using the technology more. However, one should not forget that Statoil sold its shares in EMGS ten years ago and has not been involved in the development of the technology since then.

Political processes and individuals' opinions appear to have an impact on why some oil companies decide to use CSEM surveys and some do not. Pemex have for the last few years focused on new technology and made investments in new technological methods such as CSEM, micro seismic data, and cutting-edge seismic acquisition and processing. The exploration manager of Pemex is a strong supporter of the CSEM technology, and this appears to be one of the reasons why the Pemex-projects have been highly successful. "I think that is a very big ingredient. He understands the technology from a management level, he has seen the results (…) So he is really pushing for it, and asking for CSEM data, whenever they want to review a prospect", says Ricoy (personal communication, October, 2013). When presented with a range of prospects, it is necessary to define the ones with the highest chance of success and which ones to drill first. In this phase, CSEM data is additional piece of information. The first contract in 2010 proved that the technology was helpful for Pemex exploration strategy, and this led to the contract extension in 2012. "Since the manager is really pushing for and asking for CSEM data, that has spread to the deep water assets teams, who are the users. That has been very helpful. Of course, the other really helpful thing is that Pemex are drilling very actively, and that is the ultimate test. You can say that the technology is good, but you can't really know until you drill", says Ricoy. So

far, EMGS have had a 90 % success in their predictions for Pemex. “Those are hard numbers that everyone within Pemex are seeing – even if there are technical people that do not like or agree too much with the technology”,

4.4 Value Capture

4.4.1 Patent

CSEM techniques for investigation of subsurface geology can be traced back to the 1950’s and 1960’s with the introduction of airborne systems used in mining. Later on, when more portable and inexpensive instruments were developed, CSEM techniques were used to prospect groundwater in dry areas (Everett & Meju, 2003). The concept of the *marine* CSEM technology can be retraced to the 1970’s, when the idea of transferring electromagnetic energy into the seafloor was used for deep crustal studies. The interest in environmental applications has grown during the last decades, and the method has been applied to study resistivity of oceanic lithosphere for environmental reasons (Wirianto, 2012).

CSEM methods can be defined as “those in which the experimenter has knowledge of and control over the electromagnetic field transmitted into the ground” (Everett & Meju 2003). MT methods are therefore excluded from this definition, as they involve measuring the *naturally occurring* electric and magnetic fields on the seafloor, not electromagnetic fields transmitted by man-made equipment. However, the history of the CSEM method is strongly linked to the history of the MT method. Both methods study seafloor resistivity and both use seafloor recordings of electric and magnetic fields (Constable, 2010).

Although academic activities within marine electromagnetics can be traced back several decades, it is only during the last decade – when EMGS was founded and introduced a certain application of the technique - that the use of marine CSEM for oil and gas exploration has been of significance (Constable, 2010).

CSEM methods have many applications and have been used on various issues since the 1950’s. What EMGS patented was an exact way of performing marine CSEM surveys to identify oil reservoirs, a certain application of marine CSEM. “It is simply the way of doing measurements”, says Terje Eidesmo (personal communication, October, 2013). In the

process of developing the technique, Eidesmo and his companions visited and consulted experts in the field of CSEM. Steve Constable, professor in Geophysics at the University of San Diego, and Martin Sinha, professor in Earth Sciences at the University of Southampton, are considered pioneers in this area. “Looking at the way they did measurements and the way we did it, it is hard to see a difference from an outside perspective. But the way we did it, made us capable of detecting oil reservoirs”, says Eidesmo. It was a new way of thinking, a new way to look at things, different from what Constable and Sinha were used to. Eidesmo states that what EMGS were doing is not particularly advanced compared to what the pioneers had already done. In fact, the opposite was true; Sinha and Constable were already capable of developing and designing equipment like sources when EMGS was still in its infancy. Still, the method of using CSEM to detect hydrocarbons had not been done before, and was therefore patented. “Basically, we patented the principles for this exact method of doing measurements. We have no - or maybe one or two - patents on equipment. We did not spend time on that. What we did spend time on was the methodology, which was new”, says Terje Eidesmo (personal communication, October, 2013). “Our patents are fairly wide, yet very difficult to attack, as you can not make any major changes to them. You would have to do it the way described in the patents”.

EMGS have a wide portfolio of patents and patent applications in several jurisdictions related to its marine CSEM technology (EMGS, 2007). EMGS’s main purpose with the technology patents was to get ahead of its potential competitors. They wanted to use patents to gain a head start and become the best and leading supplier of this type of technology before any potential competitors started using it.

4.4.1.1 A Patent War

Aberdeen-based company Offshore Hydrocarbon Mapping (OHM), a spin-off company from the University of Southampton, was for several years providing remote electromagnetic sensing services made to detect oil and gas (University of Southampton, 2013). Personnel from the University of Southampton were partly involved in the development of the marine CSEM technology in the early 2000’s. OHM was set up by the university in 2002 in an attempt to commercialize the technology (EMGS, 2006a). In July 2005, the UK patent office decided to assign ownership of a UK patent and several foreign applications to Statoil ASA, on what was then called Seabed Logging. The Patent Office confirmed that Statoil was the real proprietor of the patents and applications. The patent and these foreign applications were

then transferred from Statoil ASA to EMGS, as the Patent Office had concluded that the invention in the Seabed Logging patent was developed by Terje Eidesmo and Svein Ellingsrud – former Statoil employees, now at EMGS (EMGS, 2006a). Still, in spite of the patent ruling in 2005, according to EMGS, OHM continued to conduct Seabed Logging operations in areas where EMGS had confirmed patents. As a result of this, EMGS considered it necessary to pursue a legal case through the courts to protect and enforce its intellectual property rights. OHM, on the other hand, stated that EMGS's patents were not being infringed upon (First Break, 2006). In October 2006, EMGS launched proceedings in London's High Court against OHM, for the infringement of patents related to Seabed Logging (EMGS, 2006c). In March 2007, these proceedings were settled in an agreement, in which OHM agreed to not infringe upon the patent. "We are very satisfied with OHM agreeing not to infringe our patent. We have not been presented with any data to refute our belief that they had infringed our patent, and we continue to believe that they did. We will vigorously enforce our patents in the future", said Terje Eidesmo, then CEO of EMGS (EMGS, 2007). In August 2011, OHM was acquired by EMGS. "This transaction enables us to respond to increased demand in a cost-efficient manner and without adding financial risk. In addition, it provides us with a strengthened intellectual property position and access to skilled EM personnel," said Roar Bekker, EMGS's chief executive officer (EMGS, 2011a).

4.4.2 Competitors

Still protected by the patent, EMGS do not have any real competitors. EMGS is the market leader in using electromagnetic energy to detect hydrocarbons beneath the seafloor, although several companies have tried to develop their own versions of the technology. As earlier mentioned, Offshore Hydrocarbon Mapping (OHM) did provide remote electromagnetic sensing services until it was acquired by EMGS in 2011.

Dutch company Fugro are also providing their own electromagnetic services through subsidiary Fugro Electro Magnetic. Fugro Electro Magnetic offers MT data acquisition, modeling and survey design, processing and inversion, as well as interpretation and integration of EM data with other geological and geophysical datasets (Fugro Electro Magnetic, 2013a).

Stavanger-based company Petromarker is another company specializing in electromagnetic surveys for offshore exploration. Using a fully patented, vertical electric method called

TEMP-VEL, this approach is different from EMGS's marine CSEM method. This method is said to provide high accuracy, high sensitivity and deep penetration into geology. Currently, EMGS do not see Petromarker as a significant competitor (PetroMarker, 2013). However, Petromarker is expecting to reach revenues of 100 million USD by the year of 2015, a year when the total EM market is by EMGS estimated to reach 500 million USD. If Petromarker's predictions are true, they will have a 20 % market share (HegnarOnline, 2012).

ExxonMobil is using an electromagnetic method called Reservoir Resistivity Mapping (R3M) to uncover oil and gas reservoirs. This method is relatively similar to EMGS's CSEM method. R3M uses electromagnetic waves of very low frequency to detect and "map" resistive areas (ExxonMobil, 2013).

Norwegian oilfield service company Petroleum Geo-Services (PGS) has developed another electromagnetic approach called the Towed Streamer Electromagnetic System. This method was validated in October 2012, and is based on the use of a powerful EM source up front and a long streamer housing receivers, being towed behind the source (Engelmark & Mattsson, 2013). One of PGS' advantages is that they are already using seismic vessels in their Towed Streamer Seismic surveys. These seismic vessels need to be changed and adapted very little in order to operate the electromagnetic system. Specialized vessels for the EM surveys are therefor not required (Petroleum Geo-Services, 2013).

Although there are other actors in the market for electromagnetic surveys, they are of minor significance. EMGS is seen as the obvious market leader. Their strategy from the company's start has been to offer the best product and the best results. They expect to keep their dominant position in the years of 2014 and 2015, but acknowledge the other players' offerings. "PGS will probably get some traction on what they're doing. New players may also enter the market. And Petromarker are there, although they're only representing about a million dollars a year. These are different technology concepts, and the differences are large", says CEO Roar Bekker to TDN Finans (Vosgraff, 2012).

Still, EMGS do not view more competition in the future as negative; "We need someone to challenge us, especially in a growing marked. With a 100 % market share it is easy to feel like the champion of the world", says Bekker to TDN Finans (Vosgraff, 2012). Terje Eidesmo (personal communication, October, 2013) agrees that it would be beneficial to have

a high-quality competitor working on developing the market for electromagnetic surveys, together with EMGS. The skepticism EMGS is experiencing today from certain communities would possibly be reduced and the technology would probably gain more credibility if there were other dominant players in the market. “I actually think it would be profitable for us to have a good competitor. And by “good” I mean someone offering high-quality surveys, making the customers happy and encouraging them to return, and who’s not pushing down prices” says Eidesmo. Price cutting would reduce the funding for research & development, which is an essential part of the operation of a high-quality, technology-based company like EMGS. Eidesmo’s impression is that quality matters to the oil companies, but only to a certain extent. “If someone enters the market, and they are 10 % or 20 % cheaper than us, they would probably always get the contract, even though we are considered to offer the best quality. As long as they satisfy the actual technological requirements”, says Eidesmo (personal communication, October, 2013). With an operator offering very low prices, and EMGS having to compete on price, it would therefore be hard to continue investing in research & development and continuously improve their technology.

However, as mentioned, a strong competitor with the objective of maximizing quality - and not minimizing price – could be beneficial to EMGS. The oil companies might be more skeptical and suspicious to EMGS’s price offer if EMGS is the sole supplier. By not having any comparable offers from other suppliers, the oil companies might suspect EMGS of exploiting the situation; “(…) We might get a better price if there are competitors in the market, than by trying to negotiate the price one-to-one. As the only leading supplier, we might be suspected of taking advantage of the situation. The oil company would then to a larger degree try to negotiate the price downwards”, says Terje Eidesmo (personal communication, October, 2013). However, this concerns turning price competition into quality competition, and can be a tricky issue.

4.4.3 Customers

As the definite market leader within marine CSEM technology, EMGS is offering a unique product. It is globally applicable, and there are large potential customers located all across the globe; ExxonMobil, BP, Royal Dutch Shell, Pemex, Petrobras, Eni, Statoil, Total, Petronas - to name a few of the most dominant players. Being the leading supplier of the unique marine CSEM technology in the market, would therefore suggest a strong bargaining

power and ability to influence terms and prices. However, as stated above, EMGS think the presence of another high-quality supplier could increase the credibility of the marine CSEM technology. Another supplier could further develop the marine CSEM market and enable EMGS to negotiate higher prices. It is therefore questionable whether EMGS's current position as sole supplier is beneficial.

Over the last few decades, there has been a shift of power in the oil and gas industry. In the 1970's, national oil companies held less than 10 % of the world's petroleum reserves. Today, these companies control more than 90 % of the reserves (Leis, McCreery & Gay, 2012). National oil companies, often state-owned, produce the majority of the world's crude oil supply. These state owned oil companies also possess exclusive rights to exploration, production and development of petroleum resources inside their national borders (Pirog, 2007). This leads to national oil companies often achieving dominant market positions. The combination of a dominant market position and advanced contract expertise makes the national oil companies tough negotiation counterparts, highly capable of influencing terms and prices (Ulset, 2007). EMGS confirm that the oil companies generally have strong bargaining power, but also states that it varies from company to company how much they choose to exploit that power. Some companies exploit their dominant position to a full degree. Upon signing a contract with a major Asian oil company some time ago, a negotiation process was not even allowed. When presenting their contract proposal to EMGS, the company stated that this would have to be the final contract. EMGS considered the terms as highly unreasonable; "We tried to change it, but were told that changes were out of the question. We would have to accept the contract, or refrain from the job, that was the message we got (…) We did take on a lot of risk by signing that contract, but that is what you have to do now and then" (T. Eidesmo, personal communication, October, 2013). Another example of oil companies taking advantage of their strong bargaining power took place during the global financial crisis and following budget cuts. Some companies walked out of their existing contracts, refusing to continue honouring them. It is obvious that EMGS had the law on their side in these cases, but pursuing legal actions would most likely stop future contracts with the companies. This is a power imbalance that the oil companies are well aware of, allowing them to act the way some of them did during the oil crisis.

However, most oil companies are more open for negotiations and discussions than the Asian petroleum giant mentioned above. The common process is to start with a contract or agreement proposal that is relatively standard for the oil and gas industry. The contract is

then adapted to the exact assignment EMGS will perform. There are negotiations on terms, conditions and price. The oil companies usually work hard to push down prices and whether EMGS accept this or not depends on the context. “It depends on the situation, sometimes a job is dependent on the oil company getting it to a certain price, and in those cases we will have to evaluate whether we accept it or not. Sometimes you may actually take jobs where you lose money, because it is an even bigger loss if the vessels are not being used (…)” says Terje Eidesmo (personal communication, October, 2013)

4.4.4 Suppliers

As mentioned in section 2.3.1, EMGS’s strategy is to outsource all activities that are not a part of their core business. Everything related to the data acquisition and the surveys are operated by EMGS. The software used in modelling and processing is developed within the company, and the same goes for the receivers used in the surveying. Shipping companies operate the vessels, while general equipment and handling equipment is purchased from external suppliers. The source used in the survey is developed by Siemens. The latter is to a large degree part of the core business, but Siemens is manufacturing it under a strict contract and exclusive agreement with EMGS. EMGS initiated the idea of the source and contributed with a lot of information in the making process, and back then it was not obvious to Siemens that the source and technology had potential for future success.

EMGS lease survey vessels from shipping companies. The shipping companies retain ownership and operate the vessels, while EMGS are responsible for the CSEM surveys on-board. Of the four vessels chartered by EMGS today, BOA Thalassa and BOA Galatea are owned by Trondheim-based company BOA Offshore AS (EMGS, 2006b). Norwegian company North Sea Shipping is the owner of vessel Atlantic Guardian (North Sea Shipping, 2013), while EM leader is owned by Seatrans Group, also Norwegian. Seatrans Group also owns EM Express, a vessel chartered by EMGS up until recently (Seatrans, 2014). The shipping market is characterized by well-established rules and procedures in contract practices. For current vessels, EMGS have agreed to charter Atlantic Guardian until March 2016, with three optional one-year extensions (North Sea Shipping, 2013). EM Leader and EM Express were in August 2011 chartered on a pay-per-use basis. This means that the survey vessels are available and ready to mobilize on short notice – and with no standby costs - on 3, 6 or 12- month charters over the following 42 months for EM Leader and 30

months for EM Express (EMGS, 2011a). This period has now passed for EM Express. The two vessels from BOA Offshore were the first vessels ever custom-built for marine CSEM operations, and they are leased by EMGS on a long-term charter (EMGS, 2008).

4.4.5 Tacit Knowledge

In order to succeed in the area of high technology, you need to have the right idea, but also the people at the right positions. People capable of further developing the idea and the technology, people capable of bringing the technology to the next level. In EMGS, this requires what you call tacit knowledge or tacit competencies. "A lot of the technology is described in books and papers, but not everyone is able to transfer it from that level to a level where you can use the technology. This is where you find the tacit knowledge, or the tacit competencies. The competencies to bring what is known from theoretic literature into something you can use in the business", says Eidesmo (personal communication, October, 2013).

When the marine CSEM technology and the equipment were developed, the employees' tacit competencies were developed at the same time. The knowledge and expertise within CSEM technology is dependent on the employees' experience. The nature of this process ensures that it is hard to document everything in written form. That is the essence of tacit knowledge – it is hard to articulate, write down and codify, and experience plays an essential part (Teece, 1986). "There is a lot of knowledge in people's head, knowledge that can not necessarily be documented or transferred via documents. Because it also depends on experience", says Eidesmo (personal communication, October, 2013). EMGS specifically mentions their software department, consisting of top-level professionals, continuously working to develop the software used in modelling and processing. Tacit knowledge is particularly important in furthering the research and development of the technology; copying an already existing technology is relatively easy, but to bring the technology to the next level is hard.

4.5 Today and the Future

EMGS released their 2013 fourth quarter results on the 6th February 2014, together with a press release ending like this;

"(...) Going into the 2014, EMGS is in a better position than at the same time last year. The Company's backlog is improved and the Company's strong technology track record is continuously creating increased market awareness. Based on the current operational forecast, the Company expects to deliver 2014 revenues of more than USD 200 million. EMGS's long-term outlook is positive and the Company reiterates its strategy to achieve industry-wide integration of EM into the exploration workflow" (EMGS, 2014l)

EMGS experienced revenues of 44,9 million in the fourth quarter of 2013, compared to 23,6 million USD in the previous quarter (EMGS, 2014l). The fall in revenues in the third quarter is explained by the transit of vessels BOA Galatea to Mexico and EM Leader to Angola, and also increased time spent on the multi-client programs (EMGS, 2013d). "During this quarter we completed our current investment program in the multi-client libraries in Brazil and the Barents Sea. Although we believe these are good investments for the future, we are disappointed with the multi-client sales in the third quarter. For the next two quarters we see good contract coverage, as well as late sales from recent investments", said CEO Roar Bekker in a press release (EMGS, 2013d). The rise in revenues in quarter four indicate that this was true. EMGS has among others things entered into a global framework agreement with major player Shell (EMGS, 2014l). EMGS is currently in a patent dispute with Petroleum Geo-Services and their Towed Steamer Electromagnetic System, but feels confident it will win the dispute (TDN Finans, 2013).

In spite of reduction in revenues some quarters and patent disputes, the press release and the interviews conducted indicate that EMGS have a positive outlook on the future. Considering the fact that the company was severely close to bankruptcy in 2009, it might be expected that EMGS is still experiencing some repercussions.

5. Analysis

5.1 Value Creation

A distinctive value proposition is an important part of a business model. Michael Porter (as cited in Magretta, 2012) characterizes value proposition as the answer to the three questions; which customers to serve, which needs to meet and what relative price to offer its products or services at. All of these questions are summed up in the "value proposition triangle". Before going into further details, a short summary of EMGS's value proposition can be provided. The users of EMGS's marine CSEM technology are companies searching for hydrocarbons beneath the seabed. The main need EMGS is aiming to meet is the reduction of the oil companies' uncertainty when evaluating different prospects. EMGS wish to be a valuable addition to the oil companies' exploration toolkit. The company would like to highlight positive prospects and disqualify negative prospects to help reduce the oil companies' finding cost. Assessing relative price may be hard because there are few companies to compare EMGS with. However, EMGS have stated that their aim is to be a high quality supplier, and that normally means premium prices.

I will in the following sections analyze EMGS's value proposition, the value created for users by the product or service containing the new technology, in more details.

5.1.1 Which Customers?

As mentioned above, EMGS's customers are companies looking for oil and gas beneath the seabed. These customers are comprised of big companies like Royal Dutch Shell and Pemex, but also smaller companies like Rocksource. For some value propositions, choosing and segmenting customers is the first and most important step. The first step leads to the other corners of the value proposition triangle. In EMGS's case, this seems to be partly true. As research started off within the Statoil organization and the inventors were originally Statoil researchers, it seems natural that the development of the technology was directed towards Statoil's needs. In spite of Statoil not being a frequent user of the technology today, it still appears unlikely that they would finance research without any utility value for themselves. The fact that the inventors worked for Statoil suggests that the customer segment – oil companies like Statoil – may have been chosen before the needs and relative price were

assessed. The technology was not developed in an independent environment, without any idea about potential customers. The technology appears to have been developed because of a specific customer segment's need; the oil companies' need to reduce uncertainty when assessing potential prospects. This appears to be a standard way of developing new technology in this industry; to develop the technology together with an oil company and then sell it also to others afterwards.

5.1.2 Which Needs?

For many firms, choosing the need it is going to serve is the first and foremost decision, leading way to the other ends of the value proposition triangle. However, in the section above, we concluded that the customer segment was chosen first, and the technology was developed and designed to meet these customers' needs. This was the need to ease decision-making, reduce risk and reduce finding costs.

When assessing how to meet this need, EMGS had to decide which exact services and features it should offer. Through the business case, it was revealed that EMGS initially expected the oil companies to be able to perform the interpretation and data integration themselves. However, this soon proved not to be the case, and the initial value proposition focusing on data acquisition and processing, had to be changed. The oil companies' needs were not met through this value proposition, as they were lacking the expertise and competence to interpret and make use of the processed data themselves. EMGS had to change their value proposition and hire several professionals with integration skills, in order to support the oil companies in the interpretation phase. As long as the oil companies lack these skills, this was an essential move if the technology were to create value for its customers. Without proper integration with other datasets, the value creation from EMGS's marine CSEM technology would be low, because it would fail to provide accurate information.

From an outside perspective, EMGS seem to have done a lot in order to serve the oil companies' need and to maximize its value proposition. They are offering a full range of services related to its marine CSEM technology, from data acquisition via processing to interpretation and integration. The problem today are the oil companies themselves, many being hesitant of providing EMGS with the complementary data necessary to make a precise marine CSEM analysis. This is understandable, as it involves letting an outside company

into parts of its core business. The ideal situation would have been EMGS finding a way to offer interpretation and integration, *without* having to access sensitive information from the oil companies.

However, the 90 % success rate with Pemex may open the eyes of other big companies and inspire them towards closer collaboration. This success rate demonstrates the value EMGS's services can possibly create. The main issue for EMGS today is not the value proposition itself; under the right circumstances and environments, as with Pemex, EMGS value creation is undeniable. The main issue is the oil companies' lack of awareness and understanding of the value creation and unwillingness to collaborate closely. Figuring out how to deal with the integration and interpretation activities, the after-sales service and support, is also a challenge. This is related to their value chain, and will be further discussed under "Value delivery". One of the smartest things EMGS can do right now is to continue its "evangelization" of the marine CSEM technology. This allows EMGS to focus on promoting value creation and make oil companies more aware of EMGS's capability to meet their needs.

5.1.3 What Relative Price?

The *relative* price appears to be of secondary importance today, as there are few real competitors to compare with in this exact market. However, the price should provide acceptable profits for EMGS and acceptable value for customers. EMGS consider themselves a high-quality supplier. In order to continue research and development while continuously improving the quality of their technology, high prices are a necessity. Low-priced competitors are seen as a threat to profitability, as a distinctive price competition would reduce EMGS ability to offer high-quality services.

Porter, as cited in Magretta (2012) states that some value propositions are aimed at serving customers who are already under-served by offerings in the market. If this is the case, a firm can win customers through offering something extra and special. This allows the firm to set premium prices. At first glance, EMGS seems to fit into this part of the theory. EMGS offer high-quality services and there are few alternative offerings in the market. However, the fact that many of EMGS's negotiating counterparts are among the largest and most powerful companies in the world makes price negotiation hard. In addition, the oil companies' lack of awareness regarding the technology's value creation also adds to this fact. EMGS may offer

high-quality services, they may offer something extra and special, and they may in theory be entitled to set premium prices. Still, if the customers are not aware of the value creation, premium pricing will be hard to achieve.

If the oil companies were fully aware of the potential value creation and viewed marine CSEM surveying as a service essential for business, price squeezing would most likely be less common and premium pricing would be more easily achieved. One possibility to avoid price squeezing could be to enter gain sharing agreements and apply value-based pricing. This suggests that the price should be related to the value EMGS create for its customers, for instance a percentage of finding cost reduction. The idea would be to agree on a gain sharing deal that offers stronger incentives to develop more gains, to the benefit of both EMGS and the oil company. The gain sharing and value-based pricing would prevent the oil companies from pushing down prices, as EMGS would get paid according to the value they actually provide. If EMGS create large value, they will get paid an accordingly high price that could be on a premium level. EMGS have expressed that this form of pricing seems difficult to achieve in their case, but the possibilities should be investigated further.

5.2 Value Delivery

5.2.1 The Value Chain

A company's value chain should be specifically tailored to deliver the value proposition. As EMGS's value proposition appears to be reduction of the oil companies' uncertainty in the exploration phase to a – preferably - premium price, EMGS value chain should be organized and tailored to deliver this value. If the value proposition can be delivered without a customized value chain, then sustainable competitive advantage seems hard to achieve once the patents expire. For instance, if every company was capable of developing the same kind of equipment and software as EMGS, all companies would be able to meet the oil companies' needs. EMGS's value proposition would be less valuable and unique. The same applies if every company had the expertise and skills to further develop the marine CSEM technology for exploration use, or if every company had access to highly skilled interpreters of seismic and CSEM data, software specialists and top geophysicists. The value chain or set of activities organized to deliver EMGS's value proposition should differ from the

activity sets of rivaling firms. Otherwise, every rival would be capable of meeting the same needs once the patents expire.

EMGS's strategy regarding its value chain is to perform core business activities themselves, and outsource other activities. Their chain of activities can be analyzed through the framework "Porter's value chain".

The development of equipment can be placed under the "Inbound logistics" activity. The manufacturing of equipment most crucial for core business, related to the actual surveys, is under full control by EMGS. The receivers are manufactured and developed in-house. The source is manufactured at Siemens under an exclusive contract and with large amounts of input from EMGS. More standard equipment is purchased from external suppliers.

The transformation of input into finished services, the "Operations" activities, comprises survey activities. This is the closest to EMGS's core business, and they have experts in-house taking care of these activities. From the data acquisition, to the modeling, processing and interpreting, EMGS have hired professionals highly experienced at the various fields – geophysicists, geologists, engineers and software specialists, to name a few. The use of survey vessels also belongs under the "Operations" category. However, the operation of ships is not one of EMGS's core activities and is therefore outsourced to various shipping companies.

Regarding "Outbound logistics" and "Service" activities, these are related to the actual delivery of the services as well as the after-sales service and support. This has been one of the changing elements in EMGS's business model, and is also related to their main problematic area. It has been shown that EMGS's technology does not sell well without additional customized after-sales services and support. They have therefore moved from delivery of processed data alone, to also deliver interpretation and integration, as it was necessary with a higher degree of after-sales support. The customers were unwilling to buy EMGS's product without the extra service that turns it into a solution. However, this is still a problematic area for EMGS, as many oil companies are hesitant to cooperate closely and share necessary information about data. This involves letting EMGS into their core business, which many oil companies obviously are wary of. However, for the value proposition to be delivered and the technology to sell, this kind of openness seems necessary; the alternative is the oil companies gaining extensive knowledge about the technology themselves. The main

point is that EMGS's value chain has not been properly tailored to deliver the value proposition in this respect. Their technology's value is dependent on the oil companies' actions, and without the oil companies acting a certain way, the technology has low to no value. With a properly tailored value chain, the company should have found a way to avoid this sort of dependent relationship with its customers.

When it comes to "Marketing & Sales" activities, the continuous release of technical papers published by EMGS employees have probably served as a strong marketing tool. Articles being presented in leading oil & gas journals, for instance First Break and Geophysics, raises industry awareness of the marine CSEM technology. Word-of-mouth also serves as a marketing tool. If an oil company has successfully made use of the technology, the news will most likely spread to other companies as well. For instance, the Pemex-contract; the 90 % success rate is likely to stimulate curiosity and encourage other companies to use EMGS's services. The Pemex-contract represented a milestone in EMGS's ways of dealing with customers. Other companies are moving in Pemex' direction, opening up for closer collaboration and interaction.

However, the fact that the technology still suffers skepticism in many professional environments, in spite of a 90 % success rate when applied correctly, indicates that the marketing and sales effort in EMGS is underdeveloped. In the business case it is stated that political processes and the opinions of individuals matter. In Pemex, management personnel is highly positive towards the marine CSEM technology, while managers in other oil companies are more skeptical. It is natural that individuals have different perspectives on new technology, but it is important to change the perspective of the skeptics. EMGS themselves are fully convinced of their technology's value creation potential, and they have had more than ten years to market it. The fact that there are still large amounts of skeptics in the oil industry, in spite of EMGS's own ironclad faith in the technology as well as promising results, indicates that the marketing efforts performed so far have not been sufficient and should be improved in the future. Current marketing procedures combined with technical papers, word-of-mouth and success stories like Pemex may work to some degree, but clearly not good enough.

"Technology development" in Porter's value chain is described as a support activity. In EMGS's case, technology development is to a large degree part of the core business. They are continuously working to improve the marine CSEM technology, to bring it from one

level to the next. Research & development is an absolutely essential part of the operation of a technology- and innovation-based company like EMGS. EMGS strive to be the best and leading supplier. The company strives to offer high quality services and be able to charge premium prices. To achieve this goal, they need to continuously focus on technology development to maintain the advantages from the innovation and their head start.

To sum it up, EMGS's value chain is to some degree tailored to deliver their value proposition; reduction of the oil companies' uncertainty in the exploration phase to a premium price. They are focusing on core business activities, have a strong emphasis on technology development and have skilled professionals with expertise and experience within the relevant areas. Although the company is still protected from potential competitors by its patents, this value chain is also hard to copy because of the tacit knowledge element. Other companies can hire geologists and geophysicists, but these professionals will lack the experience of EMGS's employees. Of course, EMGS's employees can move to other companies, but it will still be hard for one company to build up a group of employees with the same experience and expertise as EMGS. The main problem for EMGS's value chain today is that the technology does not sell well without customized after-sales services and associated pre-sales and marketing efforts. The oil companies would either need to let EMGS into their core business *or* acquire extensive knowledge about marine CSEM themselves for the technology to be valuable. This does not indicate a properly tailored value chain. Also, since there are still large amount of skeptics in the industry, the marketing procedures do not seem to be good enough.

5.2.2 Outside Events

At last, for value to be *delivered*, a tailored value chain is not sufficient. Obstacles outside of the firm's control can disturb the firm's possibility to deliver value. The financial crisis is an example of that. Regardless of value creation and value chain; if the economy stops functioning properly and the oil companies refuse to sign new contracts, EMGS cannot deliver value. They may have a value chain perfectly tailored to their value proposition. The value proposition may be unique and special. Still, when the global economic crisis started and the oil companies had to cut budgets and strictly prioritize were to use money; many of those services – that may still be in demand under "normal" circumstances – were not among the priorities. EMGS's services were among these, and this shows that outside events can

affect a company's possibility to deliver value. The value proposition is the same as under the crisis-free period, but the possibility to *deliver* value is reduced. This is a problem as long as the technology is not regarded as an essential and important tool for the oil companies.

5.3 Value Capture

5.3.1 Legal

As of today, EMGS is viewed as having no real competitors. EMGS is the market leader within electromagnetic surveys, and none of the other EM services in the market appear to match EMGS's quality. This way, the patent seems to have provided significant protection, and no one has been able to directly copy EMGS's marine CSEM application.

Patents do not work as well in reality as they do in theory. Many patents can be "invented around" at low costs. In EMGS's case, the patent appears to have worked good in reality as well, at least according to EMGS's expectations. Their goal was to get a head start and become the preferred and leading supplier, before any competitors got to use their technology. So far, being the dominant supplier with a market share of almost 100 %, they seem to have succeeded. Regarding "inventing around", this has to a certain extent happened. The exact approach cannot be copied, but there are other suppliers offering electromagnetic surveys. EMGS patented a certain application of the CSEM technology. However, it cannot hinder other suppliers using different applications, for instance PGS' Towed Streamer Electromagnetic System and Petro marker's TEMP-VEL method. Still, these methods haven't gained a particularly strong following yet, and this may indicate that they cannot compete quality-wise with EMGS's patented application.

Theory also states that it is hard to protect a patent. The legal requirements needed to prove that a patent has been violated are very steep. However, EMGS have so far been successful in this matter. The legal proceedings launched by EMGS in London High Court towards OHM ended well, and OHM agreed not to infringe EMGS's patent or threaten to infringe upon it. This incident indicates that EMGS have had a strong focus on enforcing their patents, and mainly succeeds in maintaining them. Still, if some of the large oil companies decide to undertake EM surveys close to EMGS's application, which has been the case, it is not necessarily smart to pursue legal action. This could cause more harm than good. Gaining

and pleasing customers is the most important task for EMGS at the moment. Suing a potential customer does not appear to be a good idea.

Trademarks are another form of legal protection similar to patents. When a patent has expired, the trademark can protect the innovation's image and function as a barrier to imitation. In the literal sense, a trademark is "a word, phrase, symbol, and/or design that identifies and distinguishes the source of the goods of one party from those of others." (The United States Patent and Trademark Office, 2013). "Word" or "phrase" does not appear as prominent in EMGS's case, and they have for instance no well-known slogan. Symbol-wise, they do have a characteristic logo, but it is not well known outside of certain environments in the oil and gas industry. For example, Statoil has a logo familiar for most Norwegians, regardless of profession. However, by design or content, EMGS's application of the marine CSEM technology stands out. They are known to be the best supplier in the industry, offering the highest quality surveys, and they have almost 100 % market share. They were also the *first* supplier on the market. EMGS have become a trademark within the marine CSEM industry. They have the reputation of being the first and best supplier, and this can intimidate potential entrants and imitators.

Theory also lists trade secrets, information that is valuable to the firm and not known to the public, as a form of legal mechanism of protection. For EMGS, much of the technology is documented in technical papers. There are no explicit "hidden ingredients" like in Coca-Cola. However, in order to fully make use of it in practice, experience is needed. Full understanding and ability to take innovation from a theoretical to a practical level requires experience. This way, one can state that the employees possess tacit knowledge valuable to the firm and not known to the public, and this tacit knowledge can represent a form of "trade secret".

5.3.2 Natural

The nature of core knowledge affects how easy an innovation is to imitate. Codified knowledge can easily be transmitted and presents a higher espionage risk. EMGS and clients of EMGS have published technical papers and industry articles since 2002, so the technology is described in books and papers. The CSEM technology is not a new invention in itself; it was EMGS's *application* of the technology that was new. This indicates that there is a lot of pre-existent knowledge about the general CSEM technology, which also comprises EMGS's

version. The general principles are already out in the open. However, the fact that EMGS and EMGS employees are continuously publishing technical papers about their marine CSEM technology signalizes that they *wish* to be relatively open about it. EMGS want to inform clients and potential clients about the technology and what it can provide. As a relatively young technology, EMGS is experiencing scepticism in certain professional communities and among certain professionals. In the process of convincing the skeptics about the technology's value, EMGS might need to publish and reveal information about the technology. Increased knowledge of the technology in public might increase the risks of imitation, but it also increases the understanding of the technology's value creation and benefits. In addition, this prevents potential competitors from patenting, as it is already released to the public by EMGS.

However, as mentioned in the "Legal" section above, tacit knowledge is present at EMGS. EMGS's marine CSEM technology is an advanced and complicated technology that requires experience to be made full use of. A large part of the world's oil companies lack expertise within marine CSEM in spite of having world-class geologists and geophysicists onboard. This shows that *experience* within the area is essential to truly understand the technology, interpret data correctly and make full use of it. Tacit knowledge or competencies among EMGS's professionals therefore represent a barrier to imitation.

5.3.3 Strategic

5.3.3.1 Customers

As of today, EMGS is the only dominant supplier of marine CSEM surveys. There *are* other suppliers in the market, but they are said to represent minor market shares. On the other hand, there is a large number of oil companies present. From big, international companies like ExxonMobil and BP to smaller independent companies like Rocksource; EMGS have many potential customers. If there are many buyers in the market, "Porter's five forces" states that the seller's cost of losing one is reduced, and this reduces the buyer's bargaining power. This fits EMGS's case; the fact that EMGS have a large number of potential customers, who could benefit from their services, strengthens their power. They are not dependent on one or just a few customers. Still, as a fairly young company providing a fairly young technology, the customers are not lining up. EMGS are dependent on keeping the customers happy and willing to return.

According to Forbes ranking of the world's biggest companies, 8 of the 20 largest companies in the world are operating in the oil and gas industry (Forbes, 2013). This indicates that integrating backwards, acquiring companies within the EM surveying business, would not be a major problem. The ability to vertically integrate strengthens the customers' bargaining power. The customer would no longer need to acquire the service from outside suppliers like EMGS. However, as EMGS have patented the most effective and accurate application of the technology, there are few companies to vertically integrate with. Acquiring a company *without* a valuable application of the technology does not seem to be a good idea. Being the pioneer company in the market, EMGS possess the tacit knowledge and experience that money cannot necessarily buy. If EMGS's services deliver significantly higher value than what the oil companies are able to do themselves or can achieve through vertical integration, the oil companies might prefer to use EMGS's services. This way, EMGS's bargaining power is strong, even though the oil companies have the *ability* to vertically integrate.

There are substitutes available in the market for marine CSEM. Currently, EMGS is considered to deliver the best product, and the substitutes cannot compete on quality. Besides, EMGS was the first company to commercialize the technology, and appear to be one of the only players solely focusing on EM surveys. Most other companies are focusing on EM surveys as a bi-service in addition to seismic surveys. OHM was acquired by EMGS, PGS offer various seismic services, ExxonMobil are naturally preoccupied with other oil and gas activities, Fugro provide various geoscience services to the oil, gas and mining industry, and the list goes on. Since its founding, EMGS have focused 100 % on its marine CSEM technology, they are continuously seeking to improve the technology through research & development, and they have had a head start. This way, they appear to have a good chance of continuing to be the oil companies' preferred supplier. As of today, the substitutes in the market are of minor significance, and this increases EMGS's bargaining power. However, as marine CSEM requires integration with other datasets to provide accurate information, offering both seismic and EM services might turn out to be an advantage. The companies are then able to offer a "package" with several services. If the EM offering is of satisfying quality, this could be an attractive offer for the oil companies. However, at the current stage, EMGS's market share is significant, and the substitutes are of little relevance. If the issue of substitutes becomes more relevant, EMGS could consider integrating with a diversified oil service company like Schlumberger, enabling them to also offer a "package" of services.

"Porter's five forces" states that if the customers are well educated and well informed about the seller's product, their leverage increases. However, there is no well-developed market for these types of services today. There are few suppliers, and the oil companies lack expertise and knowledge about the technology. Therefore, the customers appear to be relatively uninformed about EMGS's product and costs.

EMGS's offering is differentiated from other suppliers' offering. It is a different application of the technology, an application that EMGS have patented. It is considered to be the best and most accurate application. Still, this differentiation may not be obvious enough to the oil companies. These companies may prefer another application of the technology if the price is lower – and it delivers satisfying results. A highly differentiated product can reduce the customer's power. However, as EMGS's application is not distinctively differentiated from the other suppliers', the oil companies' bargaining power is instead strengthened.

Theory states that the buyer's price sensitivity is of relevance. High price sensitivity leads to stronger bargaining power. Oil companies appear to be highly price sensitive to the types of services EMGS are offering. Services provided by EMGS were the first things to be cut from budgets during the 2008 crisis. If another supplier is 10 % cheaper than EMGS, the oil companies will most likely choose the other supplier, as long as the basic technological requirements are satisfied. They will do what they can to negotiate prices downwards. The price sensitivity for this kind of service increases the oil companies' leverage.

The price sensitivity may also be mentioned in relation to vertical integration and the availability of substitutes mentioned above. Even though EMGS's services may offer a significantly higher value than substitutes; if the price difference is large, the oil companies will most likely choose the cheapest alternative. And even though EMGS's services are of a significantly higher quality than what the oil companies themselves could achieve through vertical integration; they will most likely go for the money-saving alternative. This shows that the price sensitivity for these types of services strengthens the oil companies' bargaining power to a large degree.

According to "Porter's five forces", if a buyer purchases a large amount of output from the seller, this strengthens the buyer's power. This buyer is then responsible for a large amount of the seller's revenues. Pemex, who EMGS signed the largest ever marine CSEM contract with in 2010, can be considered a high-volume purchaser. However, since there are few

adequate alternative suppliers to switch to, this reduces the buyer's power. Through its extensive contract, Pemex has more knowledge about the products and services compared to many other oil companies. This should strengthen their bargaining power. However, at the same time, Pemex have witnessed EMGS's potential value creation. In their surveys so far, EMGS have seen a 90 % success rate in predictions and Pemex is less skeptical towards the marine CSEM technology compared to many other oil companies. This can ease EMGS during the negotiation process, and strengthen their possibilities to influence terms and prices.

Still, at the end of the day, the oil companies have the strongest bargaining power. The cancelling of already signed contracts during the 2008 oil crisis is an example of this. The same goes for the refusal of contract negotiations and "take it or leave it"-attitude from the major Asian oil company mentioned in the business case. What appears to be the primary reason for this is that oil companies at the moment don't really *need* the technology. EMGS's marine CSEM technology may have few and irrelevant substitutes, the buyers may be significantly less concentrated than the supplier – hundreds vs. one, and the oil companies may be uninformed about EMGS's costs and product. These are all features that should strengthen EMGS's bargaining power. But still, the oil companies are still significantly more powerful than EMGS at the moment. The oil companies do not seem to be aware of EMGS's potential value creation, and there is a lot of skepticism in certain environments. CSEM technology is young in the oil and gas industry. EMGS's bargaining power will most likely be strengthened once the technology's value is proven and it has become an integrated part of the oil companies' exploration kits. However, nothing can change the fact that EMGS will always be more dependent on the oil companies than the oil companies are on them. And nothing can change the fact that price matters; if someone is offering adequate quality to a much lower price than EMGS, the low-price alternative will most likely be picked.

5.3.3.2 Suppliers

Everything related to core business is performed internally at EMGS. The use of external suppliers is limited and the analysis of their bargaining power appears to be of less relevance compared to the power of the oil companies. The most prominent suppliers are vessel owners and Siemens, who are manufacturing the sources used in CSEM surveys. The suppliers of general handling equipment and standard elements appear to be less relevant. These types of purchases only represent a small portion of EMGS's expenses.

Before the renegotiation of the exclusive agreement, Siemens' bargaining power appeared to be low. Due to 100 % exclusivity, EMGS were Siemens' only possible buyer. EMGS on the other hand, had alternatives. If they were not pleased with Siemens, they would most likely be able to switch to a different manufacturer or perhaps eventually manufacture the source in-house themselves. Considering the fact that EMGS already had put a lot of knowledge and expertise into Siemens' manufacturing, they were also well informed about the product and Siemens' costs of producing it. This further strengthened their ability to negotiate prices and terms.

After the renegotiation, Siemens' and EMGS's bargaining power regarding the source seems to be relatively equally distributed. The current exclusive agreement limits Siemens' ability to negotiate prices, since EMGS still is their only possible buyer. But Siemens is also EMGS's only possible supplier – as longs as they want to keep their exclusivity. This way, the two parts are to a large degree dependent on each other.

Regarding the vessel owners, there is a big and international fleet of supply vessels and seismic vessels available, and the shipping marked is known for well-established contract procedures. For EMGS, the contract varies from vessel to vessel, as they have different owners. However, the common procedure seems to be short-term leasing contracts of 2-4 years. The bargaining power seems to be relatively equal between EMGS and the shipping companies; the concentration of buyers and sellers is similar – there are several shipping companies and there are several companies in need for supply vessels. EMGS is not fully dependent on their current vessel owners, and the vessel owners are not fully dependent on EMGS. Both parties could switch to other partners, although it would involve switching costs. The vessels EMGS use are specifically adapted for marine CSEM surveys, and altering them for a different use would represent some cost.

Added up; core business activities being performed internally, the exclusive agreement with Siemens and the well-established contract procedures within the shipping industry, leads to little value being transferred backwards to suppliers.

6. Conclusion

Through the study of EMGS's business model, the goal was to identify why EMGS and the marine CSEM technology have not reached the commercial success and widespread use it was predicted to reach.

The business model concept comprises three essential functions; value creation, value delivery and value capture. Value creation or value proposition concerns the choice of customers, the choice of needs to serve and the choice of pricing. Starting off in Statoil's research department, EMGS's customer segment was already from the beginning set; companies searching for oil and gas beneath the seabed. The need EMGS wanted to meet was reduction of the oil companies' uncertainty, risks and finding costs when searching for oil and gas. Striving to be a leading and high-quality supplier, EMGS would ideally like to charge premium prices to finance continuous improvement of the technology. However, the oil companies are powerful negotiating counterparts, making this type of pricing hard to achieve at all times. The biggest change to value creation was related to the interaction with the oil companies. EMGS realized that the oil companies needed help in order to make use of the technology, and they went from just offering processed data to also offering integration and interpretation. However, these after-sales services represent a problematic area for EMGS, as many companies are hesitant to share necessary information and data. The Pemex-contract represented a milestone in regards to successful interaction with an oil company, leading to an EMGS success rate of 90 %.

Value delivery concerns the set of activities or value chain necessary to create and distribute the offering. This value chain needs to be specifically tailored to the value proposition. The EMGS strategy has been to do everything related to core business themselves, and outsource the other activities. Receivers and software are developed in-house. The source is manufactured under an exclusive agreement with Siemens. Vessels are leased and operated by shipping companies and standard equipment is purchased in the market. They have a strong focus on attracting skilled professionals and activities connected to technology research and development. The main issue in regards to value delivery is delivery of after-sales services and support, as well as marketing procedures. In respect to this, the value chain is not properly customized. EMGS is strongly dependent on the oil companies either letting them into their core business or acquiring comprehensive marine CSEM knowledge

themselves. In general, oil companies seem to be skeptical of letting EMGS into core business. The marketing procedure does not seem good enough, considering the large amount of skeptics. A big "change" to value delivery also happened during the financial crisis. As the oil companies refused to sign any new contracts, EMGS's opportunities to deliver value were significantly reduced.

Value capture concerns the degree to which the innovator captures profit, and legal, natural and strategic factors are of importance. For EMGS, the patents appear to have worked well. The company was given a head start and became the leading and preferred supplier. Suppliers using other applications of the marine CSEM technology are present in the market, but they have until now been unable to match EMGS. EMGS is well known by offering the highest quality surveys and have almost 100 % market share. Besides patents, tacit knowledge is another barrier to imitation. The marine CSEM technology is a complicated technology requiring experience to be fully understood and made use of. The strategic factor revolves around EMGS's positioning in the vertical supply chain. In spite of EMGS having few real competitors, the oil companies' bargaining power is the strongest. The main reason for this appears to be the fact that EMGS is more dependent on the oil companies than the oil companies are on them. Also, many oil companies seem to be unaware of EMGS's potential value creation. Because of core activities being performed internally, the supplier bargaining power is of minor relevance.

6.1 Recommendations

By exploring the characteristics and development of EMGS's business model, a few key factors have been identified as to why the marine CSEM has not reached the predicted commercial success. This section sums up the main issues, and proposes some recommendations on the further commercialization process.

The after-sales services - the interpretation and integration phase – is problematic. The Pemex collaboration has been a great success, and EMGS should try to follow the same principles when working with other customers. If most oil companies continue to be reluctant to share information and data, integration with a diversified oil service company like Schlumberger should be considered. Then EMGS would be able to offer a "package deal" with all exploration tools available.

Considering the high amount of skeptics, the marketing procedures should be improved. The problem is not the quality of the technology; the problem is the oil companies' lack of awareness of the quality. EMGS can present a 90 % success rate when applied correctly, and this should be communicated strongly to the public.

Outside events like the financial crisis can strongly affect a company like EMGS's opportunity to deliver value. To prepare for future situations like that, EMGS should continuously work to become a more essential part of the oil companies' exploration toolkits, and not just an "icing on the cake" service. As the latter, the chances of being removed from the budgets in an economic crisis are higher.

The oil companies' strong bargaining power is hindering EMGS's value capture. To strengthen their own bargaining power, improved marketing efforts will most likely help. The oil companies should be made aware of the value EMGS's services can potentially create. Also, it is not necessarily a good thing that EMGS is basically the only supplier in the market – another high quality competitor could raise awareness of the technology's potential value creation and increase EMGS's leverage.

6.1.1 Gain Sharing Agreement

The oil companies' strong bargaining power, EMGS's status as an "icing on the cake" service and the large amounts of skeptics, could also be dealt with through a gain sharing agreement.

Gain sharing motivates successful buyer-supplier alliances (Trecha & Byrd, 2002). In a gain-sharing agreement, the supplier and the buyer share the amount of money saved or accrued as a result of a project, based on negotiated percentages. (Gartner, Inc., 2003) A gain-sharing agreement is a "win-win" contract that makes both supplier and buyer happy if things work out well (Thompson, 2006).

EMGS and the oil company have to find a way to measure the value creation caused by EMGS's services, the amount of money saved through using EMGS. The two parts should in advance agree on what percentage of this gain each part should get. However, this gain is hard to directly measure according to EMGS representatives. Value-based pricing has proved difficult to achieve. Still, further effort should be done, as a gain sharing agreement would help solve several of EMGS's issues. One solution is EMGS getting a percentage of

the oil companies' savings in exploration costs. These savings could be measured through comparing the average success rate on projects where EMGS have participated and on projects where EMGS have not participated.

A gain sharing agreement can increase the oil companies' interest in trying and using EMGS's services, as there is less risk in losing money. EMGS will get paid according to how successful and valuable their services turn out to be, and this means less risk for the oil companies. Combined with improved marketing procedures, this can convince the skeptics to use marine CSEM surveys. This may in turn increase EMGS's chances of becoming an essential part of the oil companies' toolkits, not just an "icing on the cake" service. A gain sharing agreement is also a solution to the price squeezing experienced from the oil companies. If EMGS do a good job and their services create value, they will get paid more. If their services do not create value, they will get less paid. The trick is to measure the gain and then agree on a gain sharing deal that offers added incentives to develop more gains, to the benefit of both parties. Of course, the importance of data integration, information sharing and close collaboration – the Pemex case being the prime example - must continuously be stressed.

6.2 Implications

Several reasons to why EMGS have not reached the expected commercial success has been proposed in the previous sections. The majority of these findings can be explained by the business model theory presented in the "Frameworks" section.

The issues concerning the after-sales services, the integration and interpretation phase, is related to the value delivery function known from business model theory. Theory states that a firm's value chain must be tailored to deliver the value proposition, which has not been done sufficiently in EMGS's case. The problems related to convincing skeptics and marketing can also be explained by the value delivery function. The problems related to powerful oil companies could be explained by the value capture function from business model theory. The strategic aspect, EMGS's positioning in the vertical supply chain, is problematic. The oil companies' strong bargaining power is an obstacle for EMGS's value capture. However, the legal and natural protection mechanisms function properly, protecting EMGS from competitors and imitators.

As seen above, most of the crucial observations related to the case of EMGS can be explained by the presented business model theory. However, a few theory supplements should be made in order to fully explain what is observed. It was found that outside events like the financial crisis heavily affected EMGS's possibilities to deliver value. The theory could therefore be supplemented with some thoughts on how events largely outside the firm's control can potentially affect its value creation, value delivery or value capture possibilities. In order to design a good and viable business model, the macroeconomic situation and trends has to be taken into consideration. The business model theory could also be supplemented with explicit information regarding gain sharing. Gain sharing agreements may not be applicable or appropriate in all situations. Still, it appears to be an effective way of structuring supplier-buyer alliances, which is an important part of the business model. Both the supplier and the buyer will have incentives to develop more gains to the benefits of both parties.

6.3 Suggestions for further research

The findings from this case study are not generalizable. The purpose of the thesis was to explore the characteristics of EMGS's business model, and its role in the commercialization process of the marine CSEM technology. The observations made are therefore only representative for EMGS and cannot be generalized.

As an idea for further research, it could be interesting to study the business model and commercialization process of other companies in the same category as EMGS; geophysical service companies. The observations made in this case can serve as a basis of comparison. It would be interesting to know if the observations from EMGS's case also can be observed in other cases. Also, since there is relatively little attention paid towards the business model concept in economic literature, that seems to be an area open for more research.

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Appendix 1

Interview guide

Value creation

1. Hva slags tjenester og tilleggstjenester tilbyr dere i dag, og hvordan har dette endret seg oppover årene?
2. Hva slags kompetanse mangler oljeselskapene selv for å få fullt utbytte av bedriftens EM data og analyser?
3. Hvordan kan EMGS gjennom nærmere samarbeid med oljeselskapene kompensere for manglende kompetanse hos oljeselskapene i anvendelse av EM data og analyser?
4. Kan du si noe om kostnad/nytte ved bruk av EM data for oljeselskapene?
5. Hvordan priser dere det dere leverer, hvordan tar dere betalt?

Value delivery

1. Hvilke elementer i verdikjeden gjør dere selv og hva får dere gjort gjennom andre?
2. Hva er forskjellen på hvordan dere samhandler med Pemex vs. andre oljeselskaper?
3. Kan dere forklare litt nærmere hvordan bankene gav opphav til krisen i 2009?
4. Hva hadde den innledende posisjonen som datterselskap i Statoil å si for oppstarten deres?
5. På hvilken måte bidro alliansen med Fugro til å redde selskapet ut av 2009-krisen?

Value capture

1. Hva slags avtaler har dere med eksterne leverandører, og hvordan har disse endret seg over tid?
2. I hvilken grad kan oljeselskapene påvirke priser og betingelser, og hvordan har dette endret seg over tid?
3. Hva nøyaktig tok dere patent på, og hvordan har dette fungert som imitasjonsbarriere?
4. Hvor mye taus kunnskap finnes i selskapet, og hva gjør dere i så fall for å unngå at denne kunnskapen forsvinner ut?