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Technological Innovative Capabilities of Maritime Equipment Suppliers in Møre and Romsdal.

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Preface

This thesis represents the end of our Master of Science program in International Business and Marketing, at NTNU Ålesund. The work related to this thesis has been challenging, but also interesting. The chosen research topic is based on our personal interest for the maritime cluster in Møre and Romsdal. The cluster is facing challenging readjustments, due to changing demand conditions. As such, identifying the role of innovation is more important than ever before.

First of all, we would like to thank Sindre Walderhaug at Seaonics, Svein Kleven and Oda Ellingsen at Rolls Royce Marine, and Nikolai Bjørge at Sperre Industri for providing us with valuable information in the qualitative part of this study. We would also like to thank all the companies that have taken their time and effort to participate in our survey. Furthermore, we would like to thank Frank Emblem at ÅKP for providing a list of all maritime equipment suppliers in Møre and Romsdal.

Most importantly, we would like to express our deepest gratitude to our supervisor, Professor Øivind Strand. His guidance, support and constructive feedback have been very helpful throughout this process.

Abstract

Recent studies advocate the utilization of different technological innovative capabilities (TICs), and discuss their impact on firm competitive performance. Nevertheless, there is limited research on the topic in a Norwegian context. This study examines how TICs drives the performance of maritime equipment suppliers in Møre and Romsdal, and to what extent this relationship is moderated by cluster interaction and firm size. Adopting Yam et al. (2003) capability auditing approach, this thesis uses a triangulation of qualitative and quantitative methods. Initially, three in-depth interviews were conducted to test the proposed framework, and increase the comprehension of the research topic. Empirical data was acquired through a survey of 75 maritime suppliers in the region. The findings indicate that marketing capability, manufacturing capability and organizing capability have a statistical significant affect on firm performance. Surprisingly, learning capability, R&D capability, resource capability and strategic capability did not significantly influence performance. Moreover, innovation has a magnifying impact on competitiveness, as the level of agglomeration increases. Thus, this research demonstrates that cluster interaction positively moderates the relationship between TICs and performance. However, the moderating effect of firm size has yet to be discovered. In the latter part of this thesis the findings are discussed, and implications, limitations and suggestions for future research are provided.

Keywords: Innovation, Technological Innovative Capabilities, Cluster Interaction, Firm Size

"*Not to innovate is to die*"

- Christopher Freeman (1982)

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Abbreviations

ABS- Australian bureau of statistics

CFA- Confirmatory factor analysis

CRM- Customer relationship management

EFA- Exploratory factor analysis

FPSSO- Floating production storage and offloading

GDP- Gross domestic product

GCE- Global center of expertise

ICT- Innovation communication and technology clusters

JIT- Just-in-time

KMO- Kaiser-Meyer-Olkin measure of sampling adequacy

KPI- Key performance indicator

LNG- Liquefied Natural Gas

MAROFF- Maritime activities and offshore operations

MNE- Multinational enterprise

MR- Møre and Romsdal

NGO- Non-governmental organization

OSV- Offshore support vessel

R&D- Research and development

ROS- Return on sales

SME- Small and medium-sized enterprise

SPS- simple probability sampling

TICs- Technological innovative capabilities

TQM- Total quality management

VIF- Variance inflation factor

1.0 Introduction

Innovation is universally understood as the basic building block of organizational excellence and economic growth (Schumpeter, 1934; Freeman, 1982; Rothwell, 1994; Lipczynski et al. 2013; Trott, 2012; European Commission, 2016). The emergence of the knowledge-based economy, with rapid technological advancement and global competitive pressure, makes innovation more vital for firm competitiveness than ever before. With this, there has been a rising interest from industry, academics and government on how innovation occurs and how it links to firm performance. Innovation has traditionally been understood as large firms investing in research and development (R&D) activities, isolated from other organizational departments (Schumpeter, 1934). Nowadays, innovation is considered an integrated process driven by information and knowledge (Zizlavsky, 2013). However, the literature is categorized with an increasing number of practitioner-based measures, ranking and indexes, often disconnected from academic research (Crossan and Apaydin, 2010).

Technological innovative capabilities (TICs) are considered one of the most promising and ample taxonomies in the field of innovation management today (Guan and Ma, 2003). A firm´s TICs is a comprehensive set of organizational features that enables and support technological innovation (Burgelman et al. 2010). Lall (1992) describes how TICs are related to how a firm effectively absorbs, masters and improves existing technologies, and create new ones. Thus, the framework does not only focus on the technological aspect of innovation, but includes important features of marketing, manufacturing, resources, learning, strategy and organizing (Tseng et al. 2012). Even though the link between TICs and firm performance has been explored in several studies (e.g. Yam et al. 2004; Tseng et al 2012: Guan and Ma, 2003; DeCarolis & Deeds, 1999), there is little consensus regarding the findings. Hence, this research aims to investigate how TICs affects firm performance in the context of maritime equipment suppliers in Møre and Romsdal (MR). This population is chosen due to its unique global market position, and its important contribution to value creation in Norway. Reve and Sasson (2012) argue that the knowledge embedded in the maritime industry will generate future opportunities in renewable energy, which stimulates innovation and economic growth. More detailed information about the maritime cluster is provided in section 3.2.

Industry clusters are claimed to positively influence innovation and firm performance due to rapid communication between firms, knowledge spillover and increased competitive pressure (Porter, 1990). This conveys the notion that geographic and interactive proximity between firms affects their competitive performance. However, in today's global business environment international ties are becoming more important (Boschma, 2005). Firms consequently vary in their dependence on local actors contra international ones. There has been limited research looking at such contextual features influencing the role of TICs. This research wishes to fill the gap in the literature, by investigating how cluster interaction and firm size moderates the link between TICs and firm performance.

1.1 Research questions

The research questions addressed in this study are:

RQ1: How does TICs affect the performance of maritime equipment suppliers in MR?

RQ2: Does firm size moderate the relationship between TICs and firm performance?

RQ3: Does cluster interaction moderate the relationship between TICs and firm performance?

In order to answer the research questions this study applies a triangulation of qualitative and quantitative methods, by adopting Yam et al. (2004) auditing approach. Initially, in-depth interviews will be conducted in order to get deeper insight to the research questions. Further, the TICs will be measured through a survey, directed at top-level management of the targeted companies. The questionnaire items are rated on a 7-point "Likert scale". Confirmatory factor analyses are conducted to validate the suggested scales in the research. Then, regression analyses examine the relationship between TIC´s and firm performance, and the moderating effect of firm size and cluster interaction.

1.2 Context

The presented study is limited to equipment suppliers located in the maritime cluster in MR. Consisting of 169 companies, the equipment suppliers represent the most significant part of the cluster in terms of job and value creation (GCE Maritime, 2014). For generations, the cluster has been a pioneer of technological development and operations at sea. Today, the cluster is a world leader in design, construction, equipment and operations of advanced vessels (Menon-Report, 2015). Owing to its position in the global market, the cluster was granted the status of "Global Center of Expertise" in 2014 (GCE Maritime, 2014). However, the last couple of years have been challenging for the industry, due to decreasing oil prices and relatively high cost levels. The price of Brent crude oil has decreased from USD 100,21 per barrel (02.09.2014) to USD 36,28 per barrel[1] (04.01.2016). This has lead to a dramatic decrease in demand for products and services related to offshore oil and gas extraction. As a consequence, maritime equipment suppliers are witnessing an ongoing readjustment in the industry. This pressures the cluster to innovate and find new markets. Thus, this thesis wants to increase the insight regarding the role of innovation in an industry facing great challenges.

1.3 Structure

The thesis consists of 8 chapters. The introduction (chapter 1) outlines the structure, purpose and research questions of the study. Chapter 2 describes the theoretical framework of the thesis, and ends with a proposed research model and hypothesis, based on the preliminary review of the literature. Chapter 3 describes the context of the study, while chapter 4 provides an extensive description of the methodologies used for data collection. Chapter 5 presents the results from the interviews and survey, which will by followed by a discussion of the findings (chapter 6). Chapter 7 depicts the implications and limitations of the study, and chapter 8 provides the concluding remarks of this thesis.

[1] http://quotes.wsj.com/futures/UK/BRENT%20CRUDE

2.0 Theoretical framework

The following chapter reviews the literature on important topics, forming the theoretical foundations for the thesis. Initially, we will start by defining and explaining general aspects of innovation and its linkage to cluster belonging. This will be followed by a presentation of the literature on TICs. This chapter will also present empirical findings related to the research topic, and conclude with a chosen research model.

2.1 Innovation

2.1.1 Defining innovation

Scholars acknowledge that innovation is a crucial source of firm competitiveness and growth. This has lead to a proportionate increase of publications within the topic the last decades. An electronic search for academic publications using *innovation* as the keyword results in thousands of articles, as seen in figure 1 below:

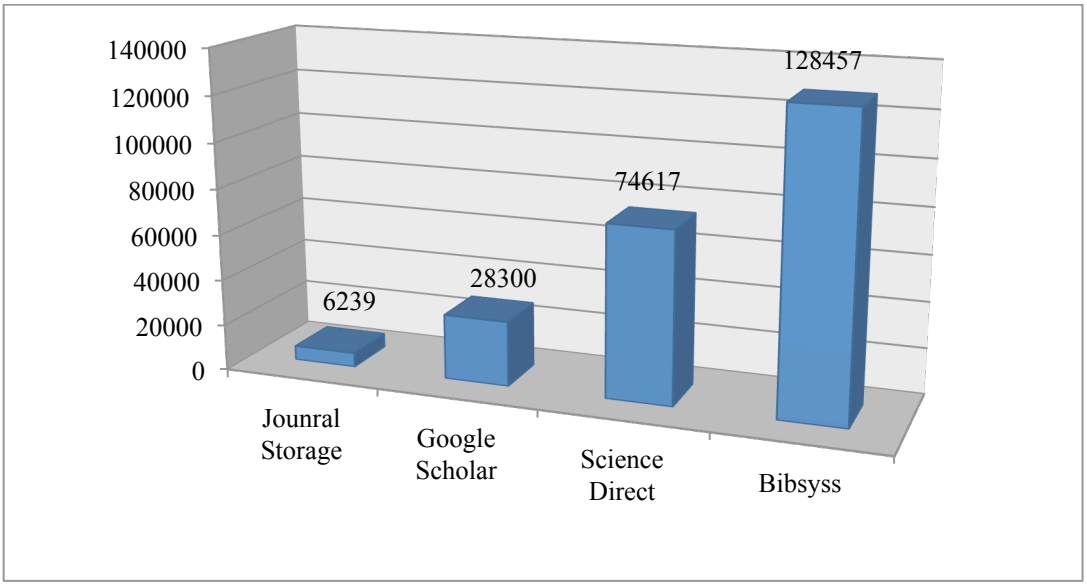

Figure 1: *Number of articles about innovation the last five years, by electronic search on Journal Storage, Google Scholar, Science Direct and Bibsys.*

Despite massive attention to the area of research, there is a lack of a clear and consistent definition of innovation (Trott, 2012). This has lead to an array of different definitions focusing on different aspects of the concept. The term innovation descends

from the Latin word "*innovāre* ", which means something that is renewed or altered[2]. Freeman (1982) explains how innovation for businesses today is related to the commercial use of new (or improved) processes or ideas. Further on, he argues that innovation includes technical, design, manufacturing and managerial activities within a firm. Myers and Marquis (1969) provides a more comprehensive definition of innovation, which is advocated by this thesis:

" *Innovation is not a single action but a total process of interrelated sub-processes. It is not just the conception of a new idea, nor the invention of a new device, nor the development of a new market. The process is all these things action in an integrated fashion".*

This definition captures several important aspects. First, innovation is not viewed as a singular event, but rather a process of activities that are linked to each other. Secondly, this definition stresses that innovation is concerned with the commercial application of ideas and inventions, rather than mere product development. This underlines the notion that economic viability is a central aspect of innovation.

2.1.2 The study of innovation

The Austrian economist, Joseph Schumpeter (1934) was the founder of modern growth theory and is considered one of the first researchers to incorporate the concept of innovation. Schumpeter argued that innovation is the organizational process of introducing new goods or methods of production, to a new or existing marketplace, which in turn leads to competitive advantage for a firm (Crossan and Apaydin, 2010). Furthermore, he advocated that technological innovation is the driving force of growth and development in a capitalist economy (Lipczynski et al. 2013). Thus, Schumpeter introduced the view that economies are more likely to experience economic growth due to the innovation of new products, rather than reduction in prices of already existing products (Trott, 2012).

The Schumpeterian view, stating that the way a firm manages its resources over time determines its innovative capabilities, continues to influence the study of innovation management today. Success in the future, as in the past, still depends on a firms'

[2] http://dictionary.reference.com/browse/innovate

ability to obtain and utilize knowledge in the development of new products or processes (Trott, 2012). However, the above definitions and descriptions hold the view that organizational innovation is rather drastic in nature. Contemporary economists and practitioners advocate that innovation also occurs incrementally. Christensen (2003) explains how *incremental* innovations appeal to current customers, as they provide improvements on already existing products. Thus, small improvements of existing products or processes can help progress the competitive position of a firm in the long run (Evelen, 2010). On the other hand, *radical* innovations tend to provide improvements greater than those demanded by the customers. These innovations are intended to create new markets, which eventually makes current markets obsolete (Christensen, 2003).

Innovation is often associated with physical change of a product, but can include an array of organizational aspects. Based on previous work by Schumpeter, Trott (2012) distinguishes between seven types of innovation: *Process innovation* refers to the development of a new piece of cost-saving technology (Trott, 2012). A well-known example includes Henry Ford´s adaptation of the assembly line to the automobile industry in the early twentieth century. Ford´s process innovation lead to mass production of affordable cars for the American middle class[3]. On the other hand, *product innovation* refers to the development of a new or significantly improved product, while *organizational innovation* includes improvement of organizational procedures (Trott, 2012). This could entail introducing a new platform for internal communication, or the introduction of new and improved accounting practices for a firm. *Management innovation* is described as the invention and implementation of new and improved managerial practices, such as introduction of total quality management (TQM) systems, or redefining organizational goals (Trott, 2012). *Production innovation* comprises of innovations such as new production planning software or implementation of Just-in-time (JIT) manufacturing systems. *Commercial/ Marketing innovation* entails finding new approaches of reaching out to current and potential customers, while *Service innovation* is related to fining new and improved ways of designing and producing services (Trott, 2012).

[3] http://www.thehenryford.org/exhibits/hf/

2.1.3 Models of innovation

During the last decades, there have been two primary schools of thought aimed at identifying the process of innovation: the resource-based view and the market-based view (Lipczynski et al. 2013). The resourced-based view maintains that internal resources of a firm (both tangible and intangible) comprise the primary context in which a firm develops its innovative capabilities. On the contrary, the market-based view holds that market conditions, not internal resources, facilitate and constrain these capabilities (Lipczynski et al. 2013). In his article from (2005), Michael Hobday reviews the literature on firm-level innovation models, including both resource and market-based models. Based on Rothwell (1994), the research classifies five generations of innovation models; Technology-push, Technology-pull, Interactive, Parallel and Network-models. Collectively, these models explain the evolution within the field of innovation management from the 1950s until today.

The first generation of innovation models, also known as technology-push models, were simple linear models developed in the 1950s. They underscored that scientific discovery "pushed" technological innovation to consumers via applied research, engineering, manufacturing and marketing (Hobday, 2005). On the other hand, the second generation of market-pull models emphasized the role of marketing as an initiator of ideas resulting from close interactions with customers (Trott, 2012). In these models, customers are the primary source of ideas, and the role of R&D is to meet market demands (Hobday, 2005). The third generation (interactive) innovation models intergrate the technology-push and market-pull perspective, by emphasizing linkage between the marketplace and R&D. Contrary to the previous models, interactive models includes no definite strarting point. Innovation is instead divided into distinct and co-dependent stages connecting complex organizational processes (Trott, 2012). Parallel models emphasized the coinciding nature of organizational activities by visualizing functional overlaps between departments within an organization (Hobday, 2005). Zizlavsky (2013) argue that parallel models are more precise than the third generation (interactive) models, as the marketplace represents both the beginning and the end of the innovation process. This view is supported by Rotwell (1994), who criticized the linear and interactive models of being to sequential in nature and not placing enough importance on the marketplace. Finally, the fifth generation of networking models illustrates how learning happens within and between

firms. These models emphasize that innovation is a networking process between actors in an economy (Hobday, 2005). In addition, these models underline the role of vertical integration, based on observations of successful joint ventures and R&D consortiums during the 1980s and early 1990s (Hobday, 2005).

2.1.3.1 Interconnected framework: the innovation circle.

From the discussion above, we see that the various models put great emphasis on how innovation is transfer throughout the organization, and how it is influenced by externalities. They also illustrate the importance of a dynamic approach to R&D, where firms must practice agility in order to respond to market demands. All of the five generations of innovation models are still, to this day, widely used by practitioners as well as academics. However, there are some clear limitations of the various models. When it comes to managing the process of innovation, the linear approach continues to be the most applied. These models tend to show the step-by-step process from idea to market introduction, rather than the actual dynamics of innovation. Berkhout et al. (2010) claim that companies following a similar sequential approach will be more focused on the next step in the model, rather than the end result. Furthermore, ideas and projects might be canceled too early, as the high levels of uncertainty needed for innovative breakthrough are not appropriately fostered (Berkhout et al. 2010). All of the models explained are primarily technology oriented, with attention to how R&D, manufacturing and sales are connected. Consequentially, there is insufficient focus on behavioral aspects of innovation and service innovation is hardly addressed in such models (Trott, 2012).

Berkhout et al (2010) propose an alternative interconnected framework, as a way of viewing firm-based innovation. The framework is based on a combination of theoretical analysis and practical experience in high-tech industries. It has proven successful for accelerating innovation among Dutch water suppliers (Berkhout et al. 2010). The model aims at capturing the best of the previously discussed models, and to include behavioral aspects of innovation. The result is a cross-disciplinary view linking behavioral science, natural science, engineering and the market place to a coherent system of processes bulling around four main nodes (Berkhout et al. 2010).

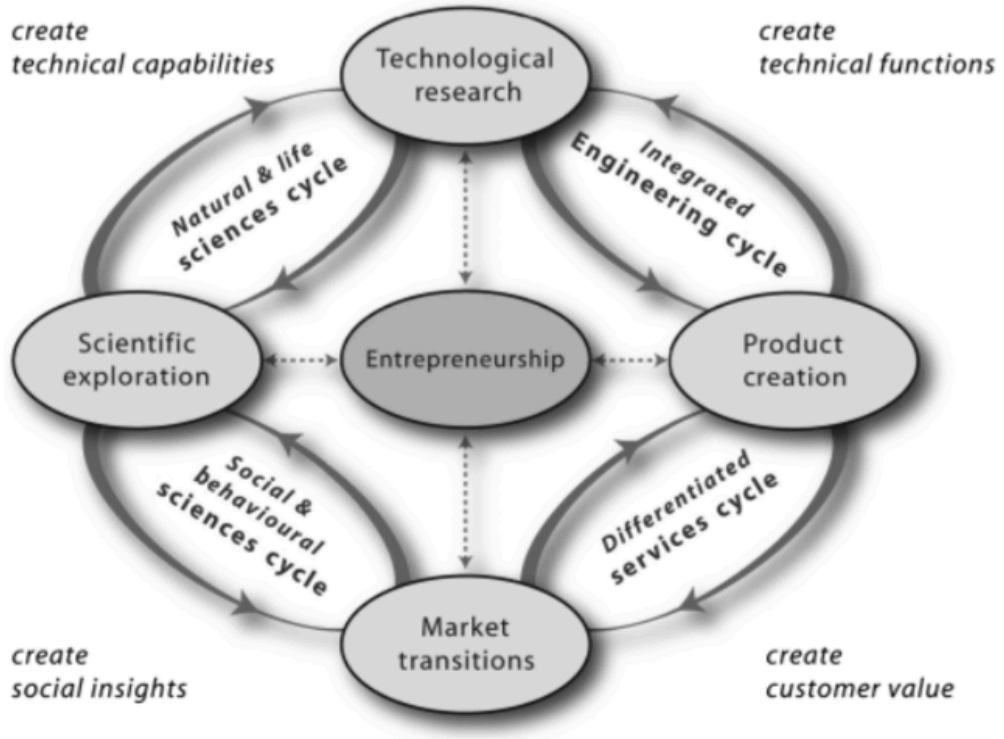

Figure 2*: The cyclic innovation model* (Adopted from Berkhout et al. 2010)

As seen in figure 5, technological research, product creation, market transaction and scientific exploration functions as roundabouts driven by entrepreneurship. The most important attribute is that the model is a circle, rather than a chain (Berkhout et al. 2010). Hence, new ideas can occur anywhere along these circles, creating waves that spreads clockwise and anti-clockwise throughout the circle (Berkhout et al. 2010). The model identifies innovation as a dynamic process in which there is a creative interaction between changes in science (left-hand side) and industry (right-hand side), and between changes in technology (top) and market (bottom). Thus, the cyclic innovation model supports the notion that industry synergy is a requisite for innovation. In today´s business environment, time is a crucial factor for the innovative capabilities of firms. According to Berkhout et al. (2010), innovative firms are more transparent in their operations and the speed of adaptation is high across organizational functions. It can therefore be argued that successful innovators are able to utilize the interaction between the four principle nodes in the model in a timely and efficient manner. Trott (2012) argues that the adaptation of the proposed framework helps firms move away from oversimplified one-way pipelines, to interconnected cycles with continuous feedback: from linear to non-linear thinking.

Table 1 summarizes the evolution of innovation models, its key characteristics and sources used in this part of the chapter

Model/ Date	Characteristics	Sources
Technology Push (1950/60s)	Simple linear model in which R&D is the driving force of innovation.	(Hobday, 2005) (Trott, 2012) (Rothwell 1994)
Market Pull (1970s)	Simple linear model in which the market place is the driving force of innovation.	*(Hobday, 2005)* (Trott, 2012) (Rothwell, 1994)
Interactive (1970/80s)	Non-linear model combining technology push and market pull model. Emphasis is on combining upstream and downstream activities.	*(Hobday, 2005)* (Trott, 2012) (Rothwell 1994)
Integration/ Parallel Models (Late 1980s)	The model displays the coinciding nature of innovation, illustrated by overlapping organizational activities. The marketplace represents the beginning and endpoint of innovation.	(Zizlavsky, 2013) (Hobday, 2005) (Rothwell 1994) (Trott, 2012)
System Integration/ Network Models (1990s)	View innovation as a networking process, emphasizing the importance of interaction with other actors in the market.	(Rothwell, 1994) (Hobday 2005) (Trott, 2012)
The innovation Circle (2010)	Cross-disciplinary framework linking behavioral science, natural science, engineering and marketing. Views innovation as a continuous circle instead of linear process.	(Berkhout et al. 2010) (Trott, 2012) (Hobday, 2005)

Table 1: *The evolution of innovation models*

2.2 Cluster and innovation

Innovation does not only depend on the individual firm, but also on interactions with other organizations. Firms in a cluster gain competitive advantage if they can find better ways of utilizing knowledge spillovers and stimulate innovation. Thus, the importance of efficiency throughout the value chain is manifested by the benefits of clustering (Kuah, 2002). Porter (1990) defines clusters as:

"*Groups of interconnected firms, suppliers, related industries and specialized institutions in particular fields that are present in particular locations".*

Today, several definitions of the concept coexist in the literature, such as: "industrial districts" or "agglomerations" (Marshall, 1920), "socio-territorial entity" or "neo-marshallian industrial districts" (Tappi, n.d.). In cluster theory, the most common argument is that geographical proximity of actors is a fundamental driver of productivity and industry development (Porter, 1998). The rationale is that short distances between firms will improve informal communication and increased knowledge sharing. In turn, this has a positive affect on innovation (Marshall, 1920; Porter, 1990).

The original concept of clusters dates back to the economist Alfred Marshall in the 1890s. Marshall defines industrial districts (clusters) as areas with high concentration of firms that utilizes synergy effects (Caldari, 2008). Furthermore, Marshall describes how the agglomeration of firms advances the development of entire economies (Belussi and Silva, 2010). The advantages of agglomeration includes the ability to create a local pool of skilled workers, share investments between network partners, and create an industrial atmosphere that enhances development (Belussi and Silva, 2010).

Porter (1998) argues that today´s economic map of the world is dominated by clusters. Accordingly, clusters promote both cooperation and competition between member firms. Rivals within a cluster compete to win and retain customers, and without competition clusters will fail (Porter, 1998). Similar to his predecessors, Porter argues that geographic proximity between industry actors will provide value-added benefits, such as increased efficiency and reduced capital outlay. In addition, clustering represents a more dynamic and practical way of organizing the value chain of particular industries (Porter, 1998).

In (1990), Porter presented the results of a four-year long study of ten nations. In this research, he analyzed the determinants of national competitiveness. He found that the competitiveness of a nation depends on the innovative capabilities of its industries. The results of this study lead to the introduction of the ”diamond model” (See figure 3).

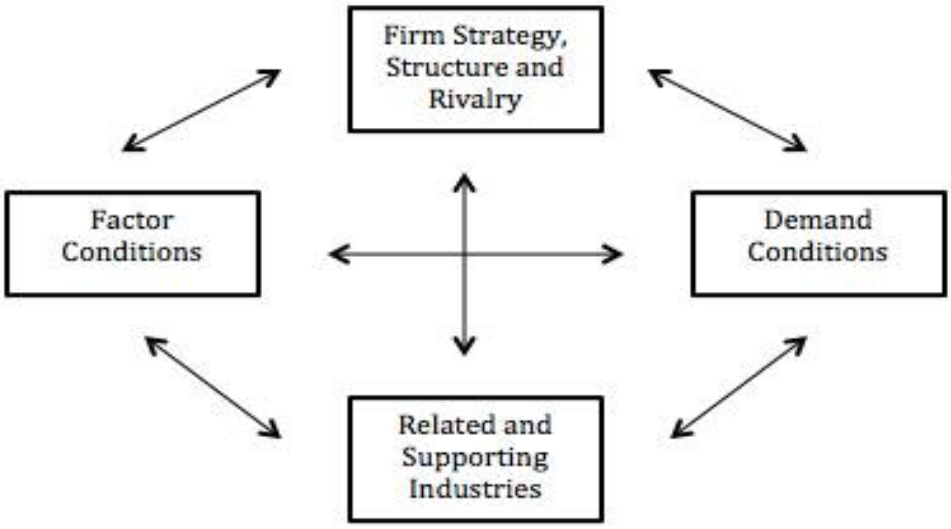

Figure 3: *Diamond model of national competitive advantage (*adopted from Porter, 1990)

The model illustrates four attributes that individually and collectively constitute the competitiveness of industries. The four factors included in the diamond model are:

- *Factor conditions* describes the access to critical input such as skilled labor, natural resources, human resources, capital resources and infrastructure, which are necessary to compete in any given industry. Factor conditions are difficult for competitors to imitate, and help companies maintain competitive advantage.

- *Demand conditions* constitutes the home-market demand for the industry`s product and services. Domestic buyers pressure companies to innovate faster and achieve more competitive advantages than its foreign rivals.

- *Related and supporting industries* create advantages in several ways. They create cost effective inputs and they provide innovation and upgrading (Porter, 1990).

- *Firm strategy, structure and rivalry* constitute the fourth determinant of competitiveness. The way in which companies are created, organized, and managed are important for success. In addition, intense domestic rivalry pressure companies to innovate and improve.

In addition to the mentioned factors, institutional contexts also influence the competitiveness of industries (Porter, 1998). The government plays an essential role by regulating taxes and investments in infrastructure, which help shape the industrial environment. In the long run, these policies will impact the way industries gain competitive advantage (Porter, 1998).

Numerous researchers provide valuable insight on how clusters enhance competitive advantage and promote innovation. However, Porters *"*diamond model*"* constitute perhaps the most inclusive theoretical framework to analyze the competitive advantage of nations or groups, based on availability of key factors. Each of these factors will be examined in chapter 3, where we analyze the maritime cluster in MR using Porter´s framework.

2.3 Technological innovative capabilities (TICs)

Technological innovation is an essential component of competitiveness and is rooted in the organizational structure of a firm. Traditionally, investments in R&D were considered by industry and academics to be the primary measure of technological innovation (Adler and Schenbar, 1990). However, recent studies show that successful technological innovations depend on capabilities in the areas of manufacturing, marketing, organization, strategy, learning, and resources allocation (Yam et al. 2004). This indicates that any single-dimension scale cannot measure technological innovation of a firm.

TICs has become on of the most attractive and promising areas of study in the field of technological innovation management (Guan and Ma, 2003). Burgelman et al. (2004) defines TICs as the inclusive set of organization characteristics that facilitates and supports technological innovation strategies. Thus, improvement of a firm´s TICs can lead to competitive advantage (Yam et al. 2004). For a capability to be a source of competitive advantage it has to be valuable, rare, difficult to imitate, and difficult to substitute (Barney, 1991). Yam et al. (2004) identify seven types of TIC´s:

1. R&D capabilities
2. Learning Capabilities
3. Manufacturing Capabilities
4. Marketing Capability
5. Resource Capabilities
6. Organizational Capabilities
7. Strategic capabilities.

R&D capability is defined as the ability to integrate R&D strategy, project implementation, project portfolio management and R&D expenditure (Yam et al. 2004). On a global scale, investment in R&D has increased with 23 % from 1991 to 2008 (Yam et al. 2004). Research indicates that an increase in R&D-investments increases product innovation rate, which enable firms to improve market shares and to gain competitive advantage (Onag, Tepeci and Basalp, 2014). However, this assumption does not apply for Norway according to statistics [4]. In (2008), OECD revealed that Norway´s investment on innovation is significantly lower than other European countries. Yet, Norway represents one of the most productive economies in the world. In 2014, Norway's R&D share of Gross Domestic Product (GDP) was 1.71%, compared to 4% in Sweden and 3,6% in Finland[5]. This phenomenon is referred to as the Norwegian *paradox* or *puzzle*. The paradox can be explained by several factors. First of all, non-R&D-based innovation, which seems to underlie the productivity of the Norwegian service sector, is difficult to capture by available quantitative indicators. Thus, common innovation indicators, such as the OSLO manual and the European Innovation Scoreboard (EIS), does not fully capture the

[4] https://www.regjeringen.no/en/topics/business-and-industry/research-and-innovation-for-business/a-norwegian-puzzle/id582903/

[5] http://www.nortrade.com/sectors/articles/the-norwegian-rd-puzzle/

innovative activities in the Norwegian economy (OECD, 2008). Moreover, Norwegian firms tend to focus on incremental process innovation, rather than radical product innovation. Process innovation is not a part of the indictors used by the EIS (OECD, 2008). Castellacci (2008) argues that the contrasting pattern of the sectorial composition of the Norwegian economy is a major contributor to the dissimilarity between R&D and performance. On the on hand, technological advanced manufacturers in Norway (e.g. science-based manufacturers and network infrastructural service providers) tend to be very innovative, often above European average. However, these groups are relatively small in Norway, and accounts for a much lower share of total production than their European counterparts (Castellacci, 2008). Hence, small firms with relatively low levels of R&D dominate the Norwegian business sector (OECD, 2008).

Yam et al. (2004) defines *learning capability* as a firm's ability to identify, assimilate, and exploit knowledge from the external environment. This emphasizes that innovation relies upon the company's capability to absorb and distribute knowledge (Onag, Tepeci and Basalp, 2014). *Manufacturing capability* refers to the ability to transform R&D results into products, which meet market needs (Yam et al. 2004). *Marketing capability* depicts a firm's ability to publicize and sell products on the basis of understanding customer needs and the competitive environment (Yam et al. 2004). *Resources capability* is a firm's ability to acquire and to allocate sufficiently capital, expertise and technology to important innovative processes. *Organizational capability* is related to the ability of securing organizational mechanism and harmony, cultivating an organization culture and adopting good management practices (Yam et al. 2004). Finally, *Strategic capability* constitutes the ability to identify internal strengths and weaknesses, external opportunities and threats, while formulating plans in accordance with the corporate vision (Yam et al. 2004).

Each of the seven TICs plays a crucial role in predicting the success of organizations, according to Guan and Ma (2003). Burgelman (2004) advocate that TICs represents the core of a company's competitive capability. Companies always need to be aware of the changing environment and develop their TICs accordingly, in order to survive (Burgelman, 2004).

2.4 Support of research model

This section of the theory chapter looks into research regarding TICs and their affect on firm performance. In addition, this section will depict the role of firm size and cluster interaction as moderating variables. The research conducted on the three topics (TICs, cluster interaction and firm size) as a whole is limited. We will therefore try to merge together the factors emphasized by the different streams of literature. These factors will outline the main research model for this thesis.

2.4.1 The positive effect of TICs on firm performance

Although many studies have been conducted on the link between TICs and firm performance (e.g. Snow and Hrebiniak, 1980; Guan and Ma, 2003; Tseng et al. 2012: Yam et al. 2004; Azubuike, 2013), there is limited consensus regarding the exact nature of the relationship. The main reason for this is the diversity in measurement of both concepts; TICs and firm performance (Tseng et al. 2012). Researchers have focused predominantly on R&D expenditures and number of patents acquired as indicators of a firm´s TICs (DeCarolis and Deeds, 1999; Snow and Hrebiniak, 1980). In addition, other measures such as absorptive capacity and citation counts have been applied (Tseng et al. 2012).

According to Adler and Schenbar (1990), TICs exist at a firm level and at a corporate level. The study focused on the development of new products and capabilities that help firms respond to unanticipated changes in technology. Building on this study, Yam et al. (2004) introduces an auditing approach to measuring TICs, and evaluates their significance among 213 Chinese manufacturing firms. The authors conducted a pilot study to verify seven TICs: learning capability, R&D capability, resource capability, manufacturing capability, marketing capability, organizational capability, and strategic capability. Three dimensions were employed as measures of firm performance: (1) innovation rate, (2) sales growth, and (3) product competitiveness. A regression analysis was conducted to examine the cause and affect relationship between the seven TICs and firm performance. The results indicated a strong link between TICs and performance. Specifically, R&D capability and Research capability were the most important indicators of firm performance (Yam et al. 2004). Further on, the study indicated that R&D capability has a stronger predictive ability on large and medium-sized firms, whereas resource allocation capability has a stronger impact on performance for small firms (Yam et al. 2004). Thus, a strong R&D capability among

resourceful companies may safeguard innovation and product competitiveness, while smaller firms have to rely more on effective utilization of limited resources. This brings the notion that firm size influences the link between TICs and firm performance.

Comparably, Azubuike (2013) studied the affect of TICs on new product development for plastic producers in Lagos, Nigera. The study indicated a strong connection between TICs and performance. The author provides further recommendations for managers to allocate sufficient time and resources to improve their TICs, as it accounts for a significant part of their production and market performance (Azubuike, 2013).

Weerawardena (2003) focused on a single dimension of the TIC-paradigm. She examined 326 manufacturing firms in Australia, in order to clarify the role of marketing capability. The study indicated that marketing capability is an indispensable factor for companies in today´s business environment, leading to growth in production and increased profits. The main findings showed that marketing capability drives innovation-based competitive strategy, and that distinctive capabilities of firms are built and cultivated by key decision makers of the firm. Accordingly, the proactive ability to rapidly respond to market needs is a paramount driver of firm performance (Weerawardena, 2003). In order to utilize marketing capabilities firms need to acquire in-depth knowledge of the marketplace, provide excellent products for their customers, and produce these products in an economic feasible manner (Weerawardena, 2003).

Shan and Jolly (2010) studied the relationship between TICs and firm performance of 213 high-technology firms in China, including foreign owned companies, privately owned domestic companies and state-owned companies. Similar to Yam et al. (2004), the study applied the following measures of firm performance: innovation performance, sales performance and product performance. Innovation performance was measured in terms of the number of new products launched the last three years, expressed as a percentage of all of the firm´s products. Sales performance was measured as the annual sales growth expressed in percentage. Product performance was measured by subjective evaluations of the firm´s competitiveness on six dimensions, using a seven-point scale ranging from (1) *not competitive at al*, to (7) *extremely competitive* (Shan and Jolly, 2010). The results indicated a positive relationship between TICs and the measures of firm performance. Nonetheless, the

results differed to some degree among the different performance indicators. R&D capability showed the strongest explanatory power on all the indicators (Shan and Jolly, 2010). Production capability showed the second strongest explanatory power, significantly influencing sales performance and product performance, but not innovation performance (Shan and Jolly, 2010).

A study conducted by Guan and Ma (2003) used export growth as an alternative measure of firm performance. The research considered how TICs and additional firm characteristics (firm size, domestic market share and productivity growth rate), influenced export performance of 214 industrial firms. The results found that all of the seven TICs, except manufacturing capability, had a positive impact on firm performance (export ratio). This entails that there is an interdependent relationship between the improvement of TICs and competitiveness. With this, the authors propose a seven-dimension framework similar to Yam et al. (2004) for measuring innovation (Guan and Ma, 2003). Further on, they explain how such a comprehensive framework assists to harmonize organizational assets with complex innovative processes. It also reduces the bias in the literature, characterized by a large amount of oversimplified measurements and inconsistent findings (Guan and Ma, 2003).

2.4.2 Moderating effect of cluster interaction

The economic effects of clustering have been advocated by numerous researchers (e.g. Marshall, 1920; Porter 1998; Morosini, 2002; Dhewanto et al. 2012). Empirical evidence suggests that both the degree of knowledge sharing and competition among firms are important factors explaining economic performance (Morosini, 2002). The rationale is that higher degree of knowledge integration and competition between member firms stimulates cost-efficient product and process innovation (Morosini 2002). According to Porter (1990), firms, government and other entities, all have a role to play in the new economics of competition. Clusters reveal the mutual dependence and collective responsibility of all these entities for creating the conditions for productive competition. He also claims that sustainable competitive advantages are the product of interaction between firms within clusters. Building on his study from 1990, Porter (1998) further argues that proximity improves a firm's innovativeness and performance by facilitating the creation of knowledge and skills.

A more recent study by Morosini (2002), focuses on social communities specializing in knowledge creation and transfer. The study is based on an examination of over 2 000 pages of archival data and academic publications. In addition, the study gathered expert opinions through a series of field visits and interviews with industrial cluster agents in southern Brazil and northern Italy. The author presents a model that incorporates the argument that both the degree of knowledge integration between cluster actors, and the scope of their economic activities, are key antecedents of economic performance (Morosini, 2002). The results show that the cluster phenomenon seems to contribute to the economic value of both the economic agents and social communities. The author also explains how local collaboration is vital in highly technological clusters, and contributes more to value creation than international partnerships.

Rogers (2004) analyzed the determinants of innovation among 3 400 Australian firms. The study investigated numerous factors influencing innovation, such as market structure, clustering of firms and export intensity. The data were collected from the Australian Bureau of Statistics (ABS) annually between 1994 and 1997. Regression analyses were conducted separately for manufacturing and non-manufacturing firms. The results indicated that small manufacturing firms exhibit a positive relationship between clustering and innovation (Rogers, 2004). In contrast, for non-manufacturing firms (e.g. service companies) only medium and large sized firms have a positive relationship between clustering an innovation. These results support the notion that firm innovation and performance is impacted by cluster interaction.

Dhewanto et al. (2012) explains how cluster interactions have a positive moderating effect on the link between innovative capabilities and firm performance. Their study was a part of a research project conducted on innovation communication and technology clusters (ICT) in Indonesia. Based on previous findings in the field, the authors developed a conceptual framework for analyzing clusters moderating impact on innovation capabilities (Dhewanto et al. 2012). Thus, firms located in advanced clusters can effectively promote cooperation between suppliers and customers. This is argued to facilitate technological innovation and entrepreneurship (Dhewanto et al. 2012).

Folta et al. (2009) studied the effect of cluster size on firm performance. The study used data on 789 biotechnical firms founded in the United states between 1973 and 1998. Several hypothesis were suggested, aimed to explain how clustering drives firm performance in the US. The results indicated that clustering benefited firms ability to innovate and attract equity partners. Furthermore, firms beneficiated financially through geographic proximity. The authors found that the main reasons for this is the reduction in R&D expenditure, and increased knowledge spillover between partners within the cluster. At the same time, the results indicated that the marginal effect of clustering decreases when clusters gets too large. This indicates a possibility of diseconomies of agglomeration when clusters exceed around 65 firms (Folta et al. 2009).

2.4.3 Moderating effect of firm size

The size of a firm is viewed as an important predictor of innovation and competitive performance. The argument is that technological change is most likely to be driven by large firms due to economies of scale or scope in R&D (Lipczynski et al. 2013). Fariborz Damanpour (1992) studied the relationship between organizational size and innovation. The author conducted a review of the literature, by studying 36 correlations derived from 20 published articles. In addition, he examined the effect of several moderating factors. The results reveal several key findings. First and foremost, organizational size is more positively related to innovation performance in manufacturing and profit-making organizations than non-government organizations (NGO´s). Furthermore, the relationship between firm size and innovation is highly sensitive to measurement practices. The researcher suggest that log transformed measures of firm size leads to higher effects on innovation, than "raw" measures such as numbers of employees. The study also revealed that firm size is more related to organizations ability to implement innovations, rather than their ability to initiate innovations (Damanpour, 1992). With this, large firms might enjoy advantages due to economies of scope in commercialization. The results also indicate that inventions are more likely to achieve their full potential if the firm´s technology base and resources are better than that of its rivals. (Damanpour, 1992).

Vaona and Pianta (2006) studied the differences between small, medium and large firms regarding their innovative performance. The study was conducted at an industry level for eight European countries: Austria, France, Italy, Norway, Netherlands, Portugal, Sweden and the United Kingdom. The authors consider 22 sectors covering most manufacturing industries. Each sector was then subdivided into three categories, depending on firm size. This approach made it possible to identify significant patterns, showing the importance of organizational size. The findings indicated that size is a significant predictor of financial performance. Specifically, the result shows that large firms outperformed smaller firms in terms of product and process innovations (Vaona and Pianta, 2006). This entails that there is a positive relationship between firm's size and innovative performance.

In (2015) Mule et al. looked at the effect of firm size on profitability and market value. Data were obtained from 53 listed companies in Kenya between 2010 and 2014. This resulted in a sample of 265 firm-year observations. The key findings of this study indicated that there is a positive significant relationship between firm size and profitability. Accordingly, firm size had a positive significant impact on a firm's market value. The authors explain these findings by underscoring the advantages of economies of scale, often enjoyed by larger firms (Mule et al. 2015).

2.5 Research model and hypothesis

Based on the reviewed literature and the empirical findings, it seems evident that some connection between TICs and firm performance exists. Furthermore, the relationship between TICs and performance appears to be influenced by firm size and interaction with other organizations within the cluster. Figure 6 illustrates the research model that will be used in this study.

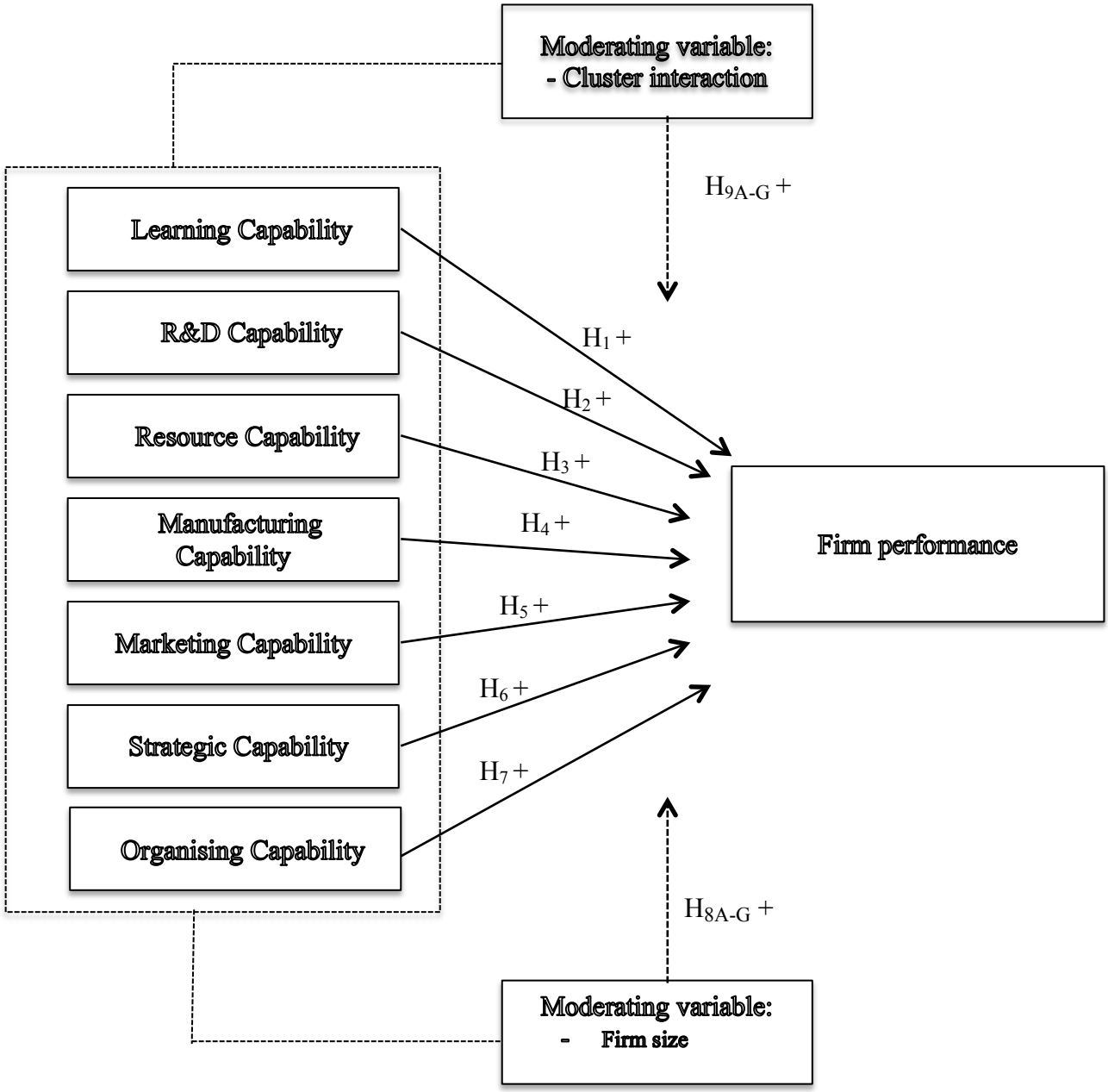

Figure 4: *Research model and hypothesis*

The underlying assumption of the research model is that the independent variables (The seven TICs) are able to predict the outcome of the dependent variable (Firm performance). In addition, the direction and strength of the relationship between each of the independent variables and the dependent variable is altered by firm size and cluster interaction (moderating variables).

Based on figure 6, this thesis will consider the following hypothesis:

H1	Learning capability positively influences firm performance
H2	R&D capability positively influences firm performance
H3	Resource capability positively influences firm performance
H4	Manufacturing capability positively influences firm performance
H5	Marketing capability positively influences firm performance
H6	Strategic capability positively influences firm performance
H7	Organizing capability positively influences firm performance
$H8_{A-G}$	The relationship between (A) Learning Capability, (B) R&D Capability, (C) Resource Capability, (D) Manufacturing Capability, (E) Marketing Capability, (F) Strategic Capability, (G) Organizing capability and firm performance is positively moderated by firm size
$H9_{A-G}$	The relationship between (*A) Learning Capability,* (*B) R&D Capability*, (*C) Resource Capability,* (*D) Manufacturing Capability, (E) Marketing Capability,* (*F) Strategic Capability, (G) Organizing Capability* and firm performance is positively moderated by cluster interaction

Table 2: *Hypothesis*

3.0 The context

The following chapter describes important contextual issues relevant for this study. As the targeted population is maritime equipment suppliers located in MR, we will start with a general description of the maritime industry in Norway. This part will highlight the industry´s history, regional areas of expertise and its importance for the Norwegian economy. Then, part 3.2 treats the characteristics of the maritime cluster in MR, and the challenges it faces in light of the recent developments in the offshore segment. Finally, the dynamics of the maritime cluster in MR will be analyzed using porter´s diamond model.

3.1 The Norwegian maritime industry.

While home for less than 0.1% of the world's population, Norway has the second largest offshore fleet in the world, surpassed only by the USA[6]. The maritime industry has for centuries impacted settlement patterns and value creation along the country´s coastal line. Norway´s landscape, with deep fjords divided by tall mountains, made boats the common form of transportation in the 19th century (Jakobsen, 2011). Traditionally, the maritime industry was based on accessibility of ductile timber and local demand for boats. Today, Norway´s competitive advantage within the industry is not related to natural resources but rather to innovation, knowledge and market relations (Jakobsen, 2011).

The size and substance of the industry depends on how it is defined. It is therefore important to retain a concise definition of the maritime industry that sets limits to which companies to include and which ones to exclude. The Norwegian Ministry of Trade (2014) defines the maritime industry as any business involved with:

"*Designing, developing, building, supplying, maintaining, modifying, owning, operating, and distributing vessels, equipment and specialized services to all types of vessels and other floating units".*

Employing such a broad definition can, however, lead to an overlap of businesses traditionally categorized and associated with other industries. For example, financial institutions such as banks (e.g. DnB, Nordea, Danske Bank) could easily be included in

[6] http://www.bluemaritimecluster.no/default.aspx?me nu

this definition. These firms are generally not thought of as traditional maritime businesses, and are not the primary group of interest for this study. We exclude providers of supportive financial services in addition to shipping companies, shipyards and the fishing fleet from our survey and interviews[7]. Nonetheless, in order to fully grasp the dynamics within the industry, the following description entails all actors with more than 50% of their turnover in the maritime industry.

Following this definition, the industry employs approximately a hundred thousand people, and had a value creation of NOK 174,4 Billion in 2013. Hence, the industry accounts for 11% of the total value creation in Norway, when excluding oil and gas companies (Menon-Report, 2015). There are maritime businesses all along the coastal line of Norway, from Østfold in the south to Finnmark in the North. The industry has become more concentrated around specific geographical clusters with different areas of expertise, in the past 20 years. Regions with offshore-dominated activities include the Stavanger area, Sørlandet and MR. These regions experienced a substantial growth in value creation between 2004 and 2014 (Norwegian Ministry of Trade, 2014). Oslo and Bergen represents the bulk of international shipping companies within the industry. Similarly, there has been an increase in job and value creation the last 10 years in these areas as well, mostly due to the development of seismic shipping companies in Oslo (Norwegian Ministry of trade, 2014).

[7] The targeted population for this study includes approximately 169 equipment suppliers located in MR.

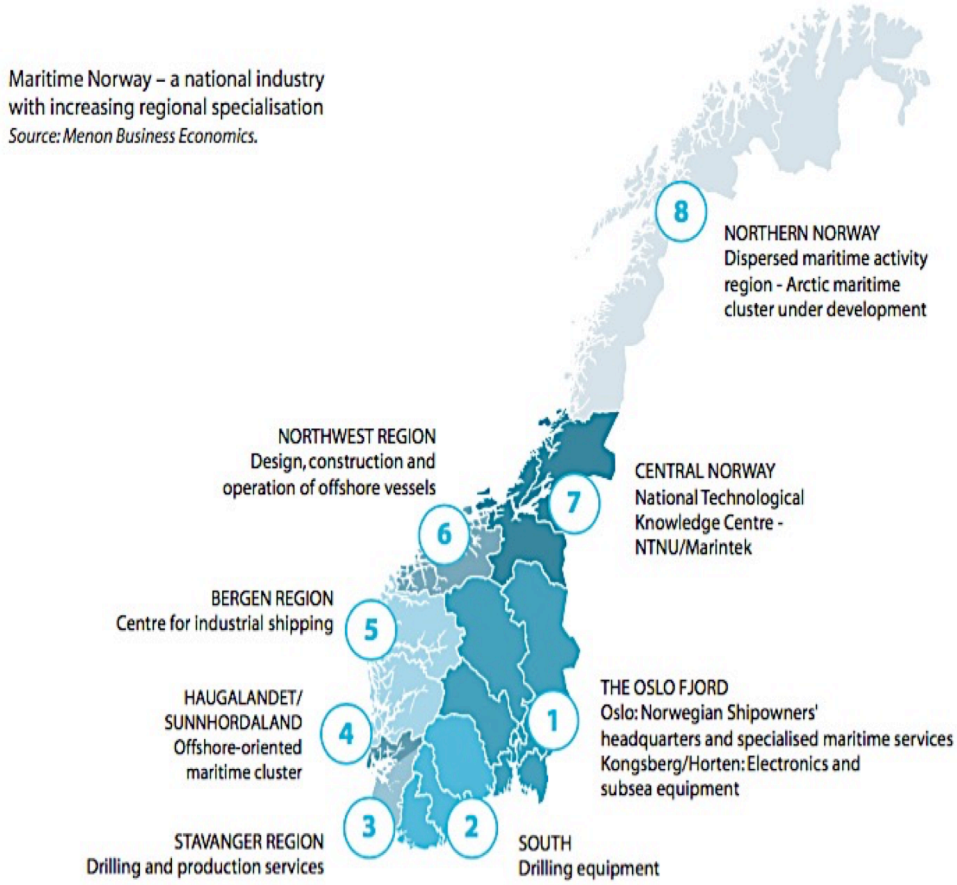

Figure 5: *Regional specialization of the maritime industry in Norway* (adopted from Norwegian Ministry of Trade, 2014)

Western and Southern Norway represents the most significant hubs of the maritime industry in Norway. Hordaland, Rogaland, Vest-Agder and Aust-Agder accounts for roughly 20% of the value creation in the industry. Nevertheless, MR is often claimed to be most important region for the maritime industry, as its represents approximately 30% of the total value creation (Norwegian Ministry of Trade, 2014). The different regional specializations within the maritime industry in Norway are illustrated in figure 5.

3.2 The maritime cluster in MR

The maritime cluster in MR is unique in the sense that it covers the whole supply chain from construction and design, to operations and service of vessels. The cluster consists of a total of 216 companies, including 13 ship consultants, 20 shipping companies, 14 shipyards and 169 equipment suppliers (GCE Blue Maritime, 2014). The 13 ship consultants entail companies providing services to the industry in the areas of design, insurance, brokerage, consulting, and classification of vessels (Norwegian Ministry of trade, 2014). The total turnover for this segment of the cluster was NOK 980 million in 2014, an increase of 3% from 2013. Return on sales (ROS) for the ship consultants were estimated at 18.1% in 2014. Employment for this group constituted 520 man-years in 2014, in which 12 man-years were seasonal labor (GCE Blue Maritime, 2014).

Shipping companies includes owners and operators of vessels and other floating units such as rigs, barges, flotels or production ships (GCE Blue Maritime, 2014). According to Jacobsen (2011), shipping companies can be divided into four categories:

- ***Deep*-Sea**: includes tank ships and transportation of dry bulk products (e.g. grain, coal, ore, cement), chemicals, containers and general cargo for foreign going trade.
- ***Short-Sea****:* involves the shipping of products for the domestic market, in addition to passenger ferries.
- ***Offshore*:** relates to supply vessels, anchor-handling vessels, seismic vessels and other vessels specialized for the offshore segment.
- ***Production****:* entails companies engaged in owning or operating, rigs, floating production storage and offloading (FPSSO) units, and subsea contractors.

The 20 shipping companies in MR had a cumulative turnover of NOK 14,9 billion in 2014, generating a ROS of 13.8%. This segment of the cluster has a yearly employment comprising of 8000 man-years. Thus, this segment accounts for approximately one-third of the total industry employment in the region (GCE Blue Maritime, 2014).

Shipyards are involved with new construction, maintenance, repair and modification of ships and other floating units. In 2014, the 14 yards in MR reached a total turnover of NOK 16 billion, an increase of NOK 1,2 billion from 2013. This constituted a ROS of 3,4 %. The workforce employed by the shipyards amounts to 4640 man-years, in which half are permanent full-time employees (GCE Blue Maritime, 2014). The three largest shipyards in Norway (Vard Group, Havyard Group and Kleven Maritime), all have their headquarters in MR. The majority of orders for these yards are related to specialized vessels for the offshore segment, with high degree of product differentiation and advanced technological equipment. In addition, there are a number of smaller yards (e.g. Solstrand verft and Sletta verft) concentrating mainly on the marine sector of the industry (Jakobsen, 2011).

Maritime equipment suppliers offer a wide range of products, specialized at different types of vessels and floating units. Due to a large degree of product differentiation within this segment, maritime equipment can be further divided into four categories: *Mechanical equipment* entails products such as propellers, engines, cranes and winches. This equipment is needed to carry out mechanical operations such as lifting and propeller maneuvers. Brunnvoll and Rolls Royce Marine are perhaps the most significant suppliers of mechanical equipment in the maritime cluster in MR (Norsk Industri, 2015). *Electrical and electronic equipment* includes specialized software, hardware, electrical propulsion system, bridge systems and DP systems [8]. Kongsberg Evotek, located in Ulsteinvik, is one of the leading suppliers of DP systems to the offshore industry. In addition, international companies such as ABB and Jotron are important suppliers of electrical and electronic equipment (Norsk Industri, 2015). *Other operating products* are described as equipment necessary for everyday operation of vessels. Suppliers in this subcategory, includes manufacturers and distributors of items such as marine paint, lubricants, chains, cables and lifeboats (Norsk Industri, 2015).

[8] Dynamic Positioning systems (DP´s) are specialized systems used to keep vessels and other floating units in the same position over the seabed by applying propellers and thrusters, rather than anchors (Norsk Industri, 2015).

The aggregated turnover for the 169 equipment suppliers in the cluster reached NOK 23 billion in 2014, a decrease of 7% from 2013. This generated a ROS of 3%, representing a 1% increase from the preceding year. The equipment suppliers contribute furthermost to the employment in the region, with approximately 8 540 man-years in 2014 (GCE Blue Maritime, 2014). Figure 6 summarizes key economic figures for the maritime cluster in MR:

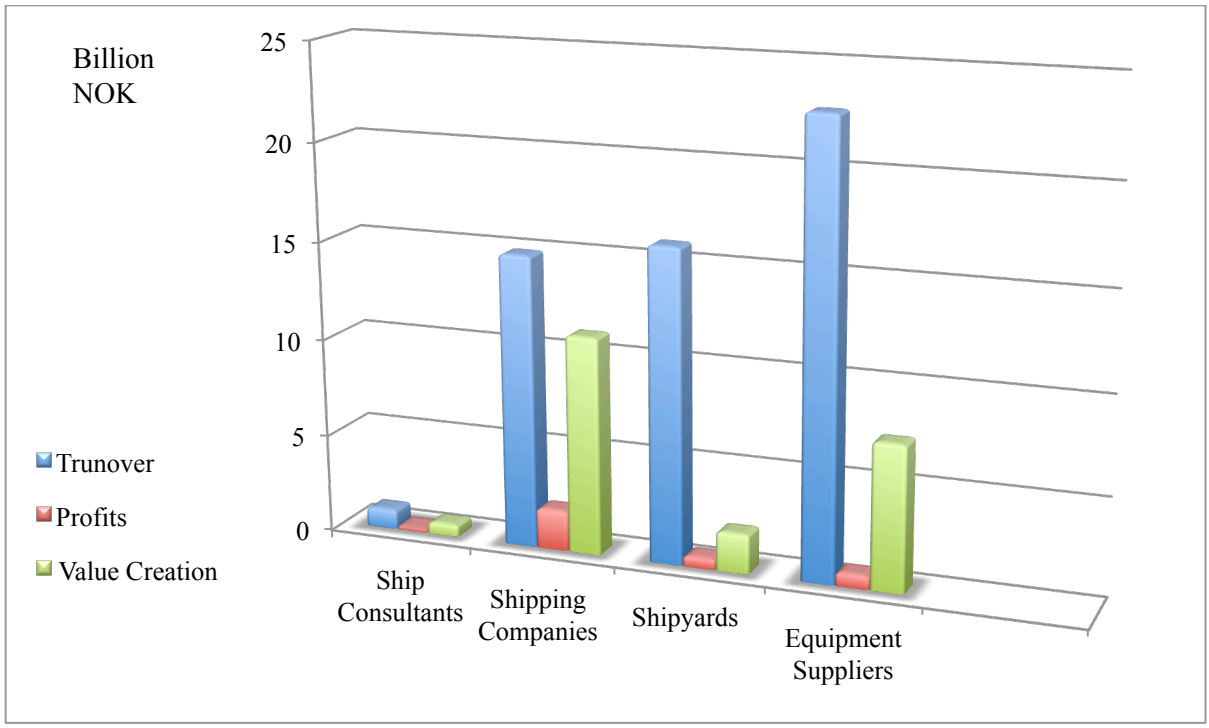

Figure 6: *Key economic figures for the cluster in 2014* (author revision of figures adopted from GCE Blue Maritime, 2014).

3.3 Decreasing demand in offshore oil and gas

Despite positive profitability trends, the maritime industry is highly dependent on steady demand in the offshore oil and gas market. The United States has nearly doubled their domestic production of oil the last several years. This has lead to intense competition between other oil producing nations, with countries like Saudi Arabia, Algeria, Qatar, and Nigeria flooding the market with oil (Menon-Report, 2015). As a consequence, the oil price has been on a downward spiral the last years[9]. On February 3th 2014, the spot price for Brent oil was USD 106,55 per barrel.

[9] http://www.nytimes.com/interactive/2016/business/energy-environment/oil-prices.html?_r=2

Two years later, on February 3th 2016, the price had decreased to USD 32,38 per barrel[10]. This has lead to a reduction in offshore drilling activity, which is an important driver for the demand of Offshore Support Vessels (OSV´s).

National Oilwell Varco (Menon-Report, 2015) estimates that there has been a decrease in the number of active oil rigs worldwide by 22,6 %, between 2011 and Q1 2015. As a response to the changes in the market, large oil companies have reduced their investsment. Seven of the largest actors on the Norwegian continental self - ExxoonMobil, Chevron, Total, BP, Royal Dutch Shell, Conoco Philips and Statoil, have decreased their capital expenditures by approximately 15 % the last two years (Menon-Report, 2015). The decrease in offshore oil and gas investments have negative effects throughout the maritime industry. When ship owners cancel or delay orders for offshore vessels, both maritime equipment suppliers and shipyards lose future revenue. This has lead to a series of layoffs in offshore-related businesses, and by mid-November 2015 there had been around 1400 dismissals in the region[11]. Nevertheless, upstream companies are hardest affected by the decreased activity on the Norwegian continental shelf. Several small shipping companies have gone bankrupt, while others have restructured their finances. To ensure the future position of the maritime cluster in MR, necessary restructuring is taking place. Chief executive officer in DNB, Rune Bjerke, maintains that there are too many small firms in the industry with limited resources. Further, Bjerke urges shipping companies to merge in order to stay competitive[12]. This indicates that a possible time-lagging effect occurs, where maritime equipment suppliers are yet to experience the full extent of the economic downturn within the industry (Norsk Industri, 2015).

[10] http://www.dn.no/finans/#/raavarer
[11] http://www.smp.no/nyheter/2015/11/23/Kraftig-økning-i-antall-permitteringer-11840476.ece
[12] http://www.smp.no/nyheter/2016/03/04/Slå-dere-sammen-12239775.ece

3.4 Cluster analysis (Porter´s diamond model)

This section will discuss the MR cluster in light of Porter´s Diamond Model. The factors in this framework will vary in terms of significance between different industries. However, the interaction between these aspects provides knowledge to the conditions in which innovation in the MR cluster occurs.

3.4.1 Related and supporting industries

Related and supporting industries in close proximity provide high-quality and cost-efficient input. The MR cluster is characterized with high levels of collaboration between industries and research organizations, facilitating learning and knowledge spillover. Furthermore, many of the firms operating in MR cluster are engaged with joint product development and R&D projects. This indicates that the strength of the maritime cluster in MR lies in the utilization of synergy effects (Monteiro, 2013).

Supporting organizations such as Møre Forskning[13] and NMK[14] facilitates innovation by offering consultant services, and allocating funds to development projects in the region. This has proven particularly useful for the growth of start-ups with limited capital (Strand et al. 2014). As one of two clusters in Norway to receive the status of GCE, the region has proven that is able to establish systematic collaboration between actors. This has spurred R&D activities and led to the establishment of a research center and different study programs.

3.4.2 Demand conditions

The main customers of the maritime suppliers are shipping companies and shipyards, and close geographic proximity to these firms assists the suppliers understanding of different product requirements. Good collaboration and high competitive pressure between actors contributes to the cluster's flexibility and ability to adapt. This makes it

[13] Møre Forskning offers research and knowledge-based development services in a broad field of areas. For more information, see: http://www.morefork.com/about-us/we-offer/1140/0/

[14] Norsk Maritime Kompetansesenter (NMK) is a part of campus Ålesund. Its objective is to be one of Norway´s most important meeting places for competence and development. For more information, see: http://www.nmcc.com/en/about/norwegian-maritime-competence-center/

easier for companies within the cluster to develop new ideas and solutions (GCE Blue Maritime, 2014)

Norsk Industri (2015) estimates that nearly 90% of all maritime equipment is exported. This is done either directly to companies abroad, or indirectly through Norwegian shipyards. Large shipbuilding countries such as Japan, South Korea and China, represents the most important markets (Norwegian Ministry of trade, 2014). Nontheless, the industry is experiencing increased competition from standardized manufacturers of mass-produced goods in low-cost countries. In addition, there is a current shift in the demand for products and services related to offshore oil and gas extraction (GCE maritime, 2015). Hence, it is crucial for the cluster to keep innovating in order to maintain its global position.

3.4.3 Factor conditions

The competitiveness of the maritime cluster in MR is influenced by the availability of relevant resources. Of particular importance is the access to specialized competence in research, technology, and market know-how (Benito et al. 2003). Norway´s population is highly educated, which provides a large pool of skilled workers for the entire maritime industry. The cluster also benefits by the collaboration with local research institutions, such as NTNU Ålesund and Molde University College. These universities offer degrees within relevant fields such as engineering, product and system design, shipping, administration and economics. In addition, the exchange of knowledge between ship-owners, shipyards and equipment suppliers has contributed to the development of innovation and productivity within the cluster (GCE maritime, 2015).

Furthermore, Norway provides an excellent basis of factors that are important for an efficient maritime industry. The country´s long coastal line facilitates water trasnportation, and the cluster enjoys the benefits of being close to international markets and important natural resources.

3.4.4 Firm strategy, structure and rivalry

The maritime cluster in MR is global by nature, with competitors from all continents. International pressure contributes to learning and innovation, and is a prerequisite for the continuous development of the cluster. Accordingly, it is important to participate in research programs taking place abroad (Norwegian Ministry of trade, 2014).

The Norwegian government places great emphasis on work in international forums, such as OECD, WTO, EFTA and the International Maritime Organization (IMO). This helps to ensure equal framework conditions for the entire maritime industry. In addition, the government has developed several bilateral shipping agreements with important trade partners, such as South Korea, Brazil and Japan (Norwegian Ministry of trade, 2014).

Furthermore, the presence of local rivalry between the firms in the region causes continuous technological advancement. Benito et al. (2003) explains how competitive local environments drive innovation and development. The reasoning is that high levels of rivalry and knowledge spillover between cluster participants, helps develop a competitive edge for the players. Hence, local competitors within the MR cluster are continuously pushing each other, leading to the development of new knowledge and technology.

4.0 Methodology

Since there have been limited research looking at TICs in a Norwegian setting, this study employs a mixed method approach through triangulation of quantitative and qualitative methods. By combining in-depth subjective views with numerical objective information, we are able to get a much broader picture of innovation among maritime equipment suppliers. The first section of this chapter will start by discussing the chosen research design. Thereafter, the qualitative and quantitative approaches will be reviewed. Finally, the statistical methods applied in the study, along with reliability and validity will be discussed.

4.1 Research design

In order to answer the identified research questions and hypothesis, it is important to find the most suitable research design. Most research can be divided into three different categories: exploratory research, descriptive research and causal research (Wilson, 2006). Exploratory research is intended to develop initial insights regarding the research topic, and provide direction for further research. On the other hand, descriptive research answers questions such as who, what, where, how and when. The findings depicts what is happening, but do not explain why it is happening (Wilson, 2006). Causal research seeks to find evidence necessary for making inferences about the relationship between variables. Hair et al. (2003) explains how research designs should not be seen as mutually exclusive, as some studies incorporate elements from different approaches. This thesis uses a mix between exploratory and causal research design, as it seeks to investigate the relationship between established theoretical concepts, and introduce new contextual aspects to the framework. Even though there are several studies investigating the role of TICs on firm performance, there are few integrating the role of clusters and firm size. Hence, this study is exploratory in the sense that we introduce two new variables into the framework of TICs.

4.2 Mixed method approach

Once the research design has been chosen, there are two primary approaches of collecting data; Quantitative method and Qualitative method. Quantitative research is undertaken using a sample of the population to produce quantifiable insights into the research topic. Following this approach, the data gathering process is theory driven and the researcher often presents hypothesis that are rejected or accepted through statistical analysis (Wilson, 2006). On the other hand, qualitative research uses a smaller number

of carefully selected subjects to generate in-depth knowledge of the topic at hand (Wilson, 2006). A combination of both methods is referred to as methodological triangulation, or mixed method approach (Larsen, 2007). By applying quantitative and qualitative methods in the same study, the researcher is able to strengthen the findings of the study (Larsen, 2007). The reasoning is that the weakness found in one of the methods is balanced by the strength of the apposing method. Furthermore, applying triangulation of methods can increase the validity in the study, as the researcher can compare findings of the two approaches (Larsen, 2007).

This study uses a triangulation approach, by applying both quantitative and qualitative methods of data collection. The qualitative part of the study entails preliminary in-depth interviews with three maritime equipment suppliers in MR. These interviews are conducted in order to get a profound understanding of the research questions, and provide guidelines for the quantitative part of the thesis. The quantitative part of the thesis includes a survey aimed at testing the proposed hypothesis through statistical analysis. As the targeted population in this study is rather small (169 firms), a triangulation approach allows us enhance the breadth and depth of our results.

4.3 Qualitative study

In-depth interview is one of the main methods of data collection used in qualitative research (Legard et al. 2003). This collection method entails face-to-face communication, in which the respondents understanding of the research topic is explored in detail (Wilson, 2006). In-depth interviews can be conducted in a structured, semi-structured or unstructured manner (Saunders et al. 2009).

4.3.1 Semi structured interview

Semi-structured interviews have a non-standardized framework, facilitating two-way communication. This type of interview normally lasts between 30 minutes to one hour. Although there is a topic list to be covered, this method is flexible and the interviewee can respond freely in his/her words (Wilson, 2006). For the presented study, it is imperative to retrieve profound insight regarding the technological innovation of maritime suppliers in MR. Hence, this study follows a semi-structured approach when conducting the preliminary in-depth interviews.

4.3.2 Interviewee selection

Qualitative research uses non-probability sampling. Thus, the research subjects in this part of the study are selected based on predetermined criteria, rather than statistical representativeness. Furthermore, this approach usually contains a small sample size. The main reason for this is the time consuming nature of qualitative research. As such, it is unmanageable to conduct and analyze hundreds of interviews, unless the research is intended to last several years (Legard et al. 2003). The exact number of respondents needed in a qualitative study depends on the scope of research (Wilson, 2006).

The population of interest for this study consists of approximately 169 maritime suppliers. A list of all suppliers in MR was provided by ÅKP[15]. Based on turnover figures for 2014, the firms were divided into small, medium and large-sized companies. Since innovation processes are more likely to be incorporated in larger organizations, firms with turnover figures below NOK 100 million were excluded from this part of the study. In order to screen the suppliers based on this criterion, we used the online search engine "Purehelp". This web-based search engine is frequently used by Norwegian businesses and academia[16]. Three suppliers were selected; Seaonics, Sperre Industri and Rolls Royce Marine. All three suppliers are from different "size groups" (small, medium and large). In order to capture important aspects of innovation, all of the interviewees were either top-level managers or directly involved with product development.

4.3.3 Interview guide

The purpose of the qualitative study was to gain deeper insight into each of the firms' technological innovative capabilities, and how this is distinctive in a Norwegian context. Wilson (2006) argues that the design of the interview guide has significant influence on the quality of the collected data. To ensure good validity, the questions were constructed based on the framework by Yam et al. (2004). The interview guide contained three sections to cover the areas that would lay the basis for answering our research questions. The first part of the interview guide entails information regarding the respondent's background, while the second part depicts information about the firms

[15] ÅKP (Ålesund Knowledge Park) is an innovation company and a regional center for business development, innovation and community building. Their goal is to help create future jobs and an attractive living and working region. For more information, see: http://www.aakp.no/default.aspx?menu=3.

[16] http://www.purehelp.no/page/om_purehelp

TICs. Finally, the last section examined the respondent's knowledge regarding the "Norwegian paradox" (appendix 1).

4.3.3 Data collection

The interviews were conducted face-to-face in the firm`s head quarters. This has the advantage of providing a much more relaxed atmosphere to collect information, and the interviewees may feel more comfortable in answering questions (Boyce, 2006). All of the interviews were conducted in Norwegian, as it represents the arterial language of the respondents. Before the interviews started, the respondents were informed about the purpose of the study and the need to tape-record the interview. In addition, the respondents were assured that the answers they provided would only be used for academic purposes. Tape-recording the interviews enabled the conversations to flow, eye contact to be maintained and interaction to occur (Wilson, 2006). The candidates also took separate notes throughout the process when important topics were discussed. The interviews lasted between 60 to 90 minutes. Afterwards, transcription of the interviews was sent to the respondents per e-mail. With this, the interviewees had the opportunity to confirm their answers, and clarify possible misunderstandings. Transcription is described as the written record of what a interviewee says in response to a question, in his or her own words (Saunders et al. 2009). There are several different ways of transcribing interviews. This study followed a "data sampling" approach. Saunders et al. (2009) defines data sampling as the process of only transcribing those sections of an audio recording that are relevant to the research. Transcriptions from the interviews with Seaonics, Rolls Royce Marine and Sperre Industri can be found in appendix 2, 3 and 4, respectively.

4.4 Quantitative study

Surveying represents a structured questioning of participants, and the recording of their responses. This can be undertaken verbally, in writing or via web-based services (Wilson, 2006). Generally, this approach has the advantage of providing numerical information about a population too large to observe directly (Larsen, 2007).

4.4.1 Sample

The research sample is critical to whether the data truly reflects the reality of the targeted population (Hair et al. 2014). Sampling procedures can be grouped under two headings: probability sampling and non-probability sampling (Wilson, 2006). Probability sampling entails that every person in the study has an equal chance of participating in the study. On the other hand, non-probability sampling is a procedure in which the researcher´s accessibility forms the basis for selecting the respondents (Wilson, 2006).

The quantitative part of this study follows a probability sampling approach by distributing the survey to all firms in the targeted population. As stated in Larsen (2007), there are several ways of conducting probability sampling. The specific procedure conducted in this study is known as simple probability sampling (SPS). Following this approach, all of the respondents have the same information and equal opportunity to participate in the research (Larsen, 2007). This increases the chance that the data obtained in the survey truly reflects the situation for the entire population of interest. In addition, we are able to compute a sampling error and the survey results are more definitive than indicative (Wilson, 2006).

4.4.1 Questionnaire design

Similar to the preliminary interviews, the survey follows Yam et al. (2004) capability auditing framework. It also incorporated supplementary features derived from the reviewed literature, as well as information retrieved from the qualitative study. The questionnaire comprised of four parts. The first part consists of descriptive data of the enterprise (including municipality the firm belongs to, number of employees, turnover in NOK, etc.). The second part contains the measurement of the TICs, while the third part includes the measures of firm performance. Finally, part four contains the measurements of cluster interaction.

The questionnaire contains 13 questions, where 5 were open-ended questions and 8 were closed-ended questions. The open-ended response format was applied where we needed detailed numerical information from the respondent, such as turnover figures, percentage of R&D personnel, number of employees, etc. A closed-ended format was used for questions that required greater uniformity of answers. In accordance with previous literature (Burgelman, 2004; Yam et al. 2004; Tseng et al. 2012), the seven TICs were rated on a 7-point Likert scale. In this part of the questionnaire, the respondents were asked to rate the firm´s capability on several factors ranging from 1 (Very poor) to 7 (very good). Such subjective measures are widely used in organizational research (Tseng et al. 2012). The survey was conducted in Norwegian to avoid any possible language barriers the respondents may hold. However, for the purpose of this study, the questions are translated into English in the results and analysis part (See appendix 5 for Norwegian questionnaire).

The questionnaire was constructed using the web-service "Survey monkey". Through our subscription, we have had access to statistical tools and were able to display findings graphically. Furthermore, the questionnaire was directed at middle and top-level management in order to receive reliable and qualified answers. A pilot-test of the questionnaire was conducted with representatives from Rolls Royce Marine, Sperre Industri and Seaonics. Feedback from the pilot were taken into account and corrected before the final version was distributed to the population.

4.4.3 Data collection

The questionnaire was self-administrated and required the respondents to read the questions and register the answers themselves. This has the advantage of being easier to administrate, and the data emerges continuously as more answers are returned. However, possible disadvantages of using self-administrated surveys could include incomplete and illogical responses. Researchers must therefore pay extra attention to the wording of the questions and the overall design of the questionnaire (Wilson, 2006). Therefore, this study focused on having clear and uncomplicated questions and a logically constructed questionnaire.

The survey was conducted from February 11th to March 16th. An email with the link to the survey was sent to one representative for each of the 169 firms[17]. In the email we presented ourselves, and the purpose of our study (Appendix 3, a). After the survey had been available over a period of 2-3 weeks, reminder e-mails were sent to the firms that had not answered the survey (Appendix 3b). Of the 169 questionnaires distributed, 75 complete answers were collected. This represents a response rate of 44%[18].

4.4.4 Operationalization of variables

The variables used in the research model draws on existing literature regarding TICs and industrial clusters. With this, we made sure that the concepts we wanted to measure were being measured. In addition, inputs from the qualitative part of the study were incorporated in the questionnaire to supplement pre-established constructs and scales.

4.4.4.1 Dependent variable: Firm performance

The dependent variable in this study is firm performance. Traditionally, firm performance has been measured exclusively by financial indicators. However, recent studies in the field of innovation management argue a more comprehensive approach (e.g. Yam et al. 2004; Burgelman, 2006; Tseng et al. 2012; Guan and Ma, 2003). The presented study applied three performance indicators: innovation performance, sales performance and product performance. Innovation performance was measured in terms of the number of new launches/innovations expressed as a percentage of all products/services in the company, over the last three years. Sales performance was measured by turnover growth in percentage from the preceding year. Product performance was measured through the evaluation of the firm's performance concerning three dimensions. Table 3 shows the questions used in the survey to measure the variable firm performance, along with explanation and related sources.

[17] The candidates created a list containing of e-mail addresses to the managers of the different firms. The survey was then distributed to one executive, usually the managing director.
[18] (75/ 169) x 100% = 44%

Q#	Question on Performance	Explanation	Sources
2	In percentage, what is the change in the company´s turnover from last year?	Growth in turnover represents an important dimension of a firm´s market advantage. It shows whether the firm´s approach to innovation has been financially successful.	Yam et al. (2004), Tseng et al. (2012), Evangelista et al. (2001), Guan and Ma (2003), Burgelman (2006)
8	What percentage of the company's goods and/ or services the last three years represents new launches or significant technological innovations?	The increase in product innovation rate is often rooted in the accumulation of capabilities.	OECD (1997) Yam et al. (2004), Tseng et al. (2012), Evangelista et al. (2001), Guan and Ma (2003), Burgelman (2006)
9	How would you rate the company's position compared to your nearest competitor, in regards to the following factors: 1) *Product/ service quality?* 2) *Cost level?* 3) *Development time from R&D to commercial production?*	It is believed that most TICs are highly associated with product performance.	Yam et al. (2004), Tseng et al. (2012), Guan and Ma (2003), Burgelman (2006)

Table 3: *Questions comprising firm performance*

4.4.4.2 Independent variables: The seven TICs

The following TICs serves as the independent variables in this study: learning capability, R&D capability, resource capability, manufacturing capability, marketing capability, organizing capability and strategic capability. A review of the TICs literature (Yam et al. 2004; Tseng et al. 2012; Guan and Ma 2003) suggest that 7 scales containing 3-4 four items (questions) should be applied in this study. Furthermore, this study uses a Likert-type 7-point scale for measuring the questions comprising the different TICs. The questions used to measure the different TICs are presented in table 4. The table also shows the origin of the scales and explanation of its relevance.

Scale	Question	Explanation	Sources
Learning Capability	**#6)** How would you evaluate the firm `s capability to: …Assess trends relevant for the company …Adapt technology to match market needs. …Collaborate with other actors to identify opportunities in different market segments	This should help us investigate how the firms are able to pass on lesson across boundaries and time.	Yam et al. (2004), Tseng et al. (2012), Guan and Ma (2003)
R&D Capability	… Invest sufficiently in the development of new products and/or services …Efficiently communicate R&D activities across the various departments …Apply customer feedback in technology development …Specify clear goals and plans for research projects	Included to determine the firms ability to integrate R&D strategy and expenditure, with other organizational activities.	Yam et al. (2004), Tseng et al (2012), Guan and Ma (2003)
Resource Capability	… Employ qualified staff to the various departments … Allocate adequate resources for courses and further education of employees …Allocate adequate resources for the development of products and systems	By exploring the firms resource capability, we get an insight to whether they allocate appropriately capital, expertise and technology in the innovation process.	Burgelman (2006), Yam et al. (2004), Tseng et al. (2012), Guan and Ma (2003)

Manufacturing Capability	…Implement efficient methods of production …Develop a project from R&D to commercial production …Implement quality control throughout the supply chain …Generate feasible product development ideas	Indicates how the firms are able to transform R&D output into products, which meets the needs of the customers.	Yam et al. (2004), Tseng et al. (2012), Guan and Ma (2003)
Marketing Capability	… Establish good relationships with customers …Maintain a positive reputation …Attain information of different market segments … Meet customers needs after sales	This tells us how the firms are able to understand customer needs and the competitive environment.	Yam et al. (2004), Tseng et al. (2012), Guan and Ma (2003), Burgelman (2006)
Organizing Capability	…Coordinate R&D, marketing and production activities …Handle multiple time and resource demanding projects in parallel …Communicate with suppliers and customers …Measure the performance of its employees	By exploring the difference in organizing capability, we should get an idea of how the firms secure organizational harmony and implements good management practices.	Yam et al. (2004), Tseng et al. (2012), Guan and Ma (2003), Burgelman (2006)
Strategy Capability	...Identify external opportunities and threats … Identify internal strengths and	Included to investigate the firms capacity to identify internal strengths and weaknesses and external	Yam et al. (2004), Tseng et al. (2012), Guan and Ma (2003)

	weaknesses …Implement strategic plans using quantitative objectives (e.g. balanced scorecard) …Convey the its overall goals and core values to the employees	opportunities and threats. It also tells us how they adapt different strategies that can handle the market environment.	

Table 4: *Questions comprising the seven TICs*

4.4.4.3 Moderating variables: Cluster interaction and firm Size

While the relationship between the independent variables and the dependent variable has been indicated by prior research, there are few studies looking at how interaction between collaborators in a cluster and firm size affects this linkage. Hence, the operationalization of the moderating variables is primarily based on the results from the qualitative interviews. Nevertheless, previous research incorporating other, but similar, innovation taxonomies are also used to argue the structure of these variables.

The operationalization of *firm size* was based on a question in the survey inquiring about the number of employees in the firm. As implied by previous studies (e.g. Damanpour, 1992; Vaona and Pianta, 2006; Muele et al. 2015), large firms might be better equipped to innovate than smaller ones. This is based on the notion that large firms have more resources to implement large-scale innovations (Damanpour, 1992). Hence, this variable was included to investigate whether larger firms in the sample had a stronger relationship between TICs and performance than smaller ones.

Based on the reviewed literature in chapter 2 and the preliminary in-depth interviews, it seems apparent that the interaction between firms in a cluster influences innovation and performance. The variable *cluster interaction* was measured through 3 questions. First, the respondents were asked to rate how important other local actors within the cluster are to the economic performance of their firm, on a 5-point Likert scale. The respondents were also asked which of the following actors are most important for their company: local actors, national actors or international actors. Local actors were defined as organizations (e.g. partners, suppliers, customers, institutions, etc.) with

headquarters located in MR. National actors were defined as organizations with headquarters located in other counties in Norway, while international actors were defined as organizations with headquarters located outside Norway. This question was included to investigate if collaboration within the cluster is more important than external networks. According to Morsini (2002), such questions allow the researcher to understand how dependent the firm is on local inputs to innovation, contra international inputs. Finally, on a scale from (1) *not important* to (5) *extremely important*, the respondents were asked how important local collaboration is for the innovative capability of firms located in the cluster.

4.4.5 Statistical analyses

The following section will provide a brief description of the different statistical analyses applied in this study. We will use the results from the different analyses to accept or reject the proposed hypothesis (cf. Table 4). In addition, the results will be compared with the qualitative part of the thesis to discuss its implication to the research questions. The quantitative analysis is conducted in three steps: (1) descriptive statistics, (2) data reduction through factor analysis, and (3) hypothesis testing through multiple regression analysis.

4.4.5.1 Descriptive statistics

Descriptive analysis is used to describe the basic characteristics of a sample, and to check for violation of important assumptions underlying statistical techniques (Pallant, 2010). Descriptive statistics is suitable for both continuous variables (e.g. age), and categorical variables (e.g. Sex). The most commonly used descriptive statistics are measures of central tendency (mean, mode and median), and measures of variability (Wilson, 2013).

Descriptive analyses often start by presenting mean scores, which reveal the arithmetic average of a data set. This is calculated by summing all the values, and dividing by the number of cases (Wilson, 2013). Unlike the mean, the mode can be computed with any type of data (nominal, ordinal, interval and ratio). The mode represents the value in a set of data that occurs most frequently (Wilson, 2013). Thus, it can show major groupings of values within a sample (e.g. age, sex, nationality, industry, etc.).

Another widely used measure of central tendency is the median. When all values in a data set are put in ascending or descending order, the median is represented by the value located in the middle (Wilson, 2013). The median has an equal number of cases above and below the represented value. If the number of values is an even number, and therefore no single middle value exists, the median is calculated by adding the two middle values and diving by two (Hair et al. 2014). The median has the advantage of being unaffected by extreme values in the data set, unlike the mean (Wilson, 2013).

Measures of variability (or dispersion) indicate how "spread out" a set of data is (Wilson, 2013). The most commonly used measure of variability is the standard deviation within a data set. Standard deviation is calculated by taking the square root of the sum of the squared deviations from the mean, divided by the number of observations minus 1 (Hair et al. 2014). The standard deviation depicts the average distance that the values in a data set are away from the mean (Wilson, 2013). Consequently, a small standard deviation indicates a coherent sample and agreement among respondents.

Pallant (2010) argues that descriptive analysis should provide some information concerning the distribution of scores. For this purpose, two measures are frequently applied: skewness and kurtosis. Skewness measures the symmetry of a distribution (Hair et al. 2014). A positive skewness indicates clustering of scores at low values (left-hand side of a graph), while a negative skewness indicates clustering of scores at high values (right-hand side of a graph). Kurtosis, on the other hand, provides information about the "peakedness" of the distribution (Pallant, 2010). Positive kurtosis values entails a peaked distribution, while values below 0 indicate a relatively flat distribution with many cases with very high or very low values (Pallant 2010). Preferably, both skewness and kurtosis should be as close to 0 as possible, indicating perfectly normal distribution of scores (Hair et al. 2014).

4.4.5.2 Factor analysis

The primary purpose of a factor analysis is to define the underlying structure among the variables in the study (Hair et al. 2014). It is used by researchers to reduce a large set of variables to a more manageable number, prior to using them in other analyses such as multiple regression analyses or discriminant analyses (Pallant, 2010).
Factor analysis can be either exploratory or confirmatory. Exploratory factor analysis (EFA) is often used to gather information about (explore) the interrelationship among a set of variables. On the other hand, confirmatory factor analysis (CFA) is used to test (confirm) specific hypothesis or theories concerning the structure underlying a set of variables (Pallant, 2010).

In this study, factor analysis will be conducted to reduce the variables connected to the different TICs, into seven summated scales. We will also reduce performance variables and cluster interaction variables, into more manageable summated scales. However, firm size is measured by a single variable (number of employees) and will therefore remain unchanged. For this thesis, CFA will be conducted since the main constructs of the thesis are based on prior research and literature. In addition, this thesis will use a principle component analysis (PCA) approach. PCA focuses on the variation among and between variables to identify strong patterns in the data set (Hair et al. 2014).

The critical assumptions underlying factor analyses are primarily concerned with sample size and correlation among variables. As a general rule of thumb, the sample should consist of minimum 50 observations. Further on, factor loadings should be +/- 0.5, and Bartlett´s test of sphericity should be statistically significant at P <. 05 (Hair et al. 2014). Multicollinearity indicates to what extent a variable can be explained by the other variables in the analysis. Since the objective of a factor analysis is to identify interrelated sets of variables, some degree of multicollinearity is desirable. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is used to evaluate multicollinarity. The KMO index ranges from 0 to 1, with 0.6 suggested as the minimum value for a good factor analysis (Pallant 2010). The Cronbach´s alpha coefficient measures the reliability of a scale. It ranges from 0 to 1, with 0.7 as a suggested minimum (Hair et al. 2014). In order to evaluate the reliability of the scales computed in this thesis, Cronbach´s alpha coefficients will also be presented and discussed.

4.4.5.3 Regression analysis

Multiple regression is not just one technique, but a family of techniques that can be used to explore the relationship between a single dependent (criterion) variable, and a number of independent variables (predictors). As such, multiple regression is based on correlation, but allows for a more sophisticated exploration of the interrelationship among variables (Pallant, 2010). The objective is to use the independent variables, whose values are known, to predict the value of the dependent variable. This is found by determining how much of the variance in the dependent variable is explained by the independent variables (Hair et al. 2014).

There are three different types of multiple regression analyses that can be conducted: (1) Standard or simultaneous, (2) Hierarchical or sequential, and (3) stepwise (Hair et al. 2014). When using the standard or simultaneous approach, all of the independent variables are entered into the equation together. Then, each of the predictors is evaluated based on their explanatory power (Pallant, 2010). In hierarchical multiple regression (also known as sequential regression), the independent variables are entered into the equation in the order specified by the researcher. In the last method, stepwise multiple regression, a list of independent variables is provided and the researcher enters them based on statistical criteria (Pallant, 2010).

When assessing the regression model´s predictive capability, several measures must be considered. The coefficient of determination (R^2) indicates the overall fit of the variate (Pallant 2010). More specifically, the R^2 measures the proportion of the variance of the dependent variable that is explained by the independent variables (Hair et al. 2014). The adjusted R^2 is a more conservative measure, accounting for the number of observations in the research. The significance level (alpha) denotes the threshold we evaluate the p-value against. Consequentially, the alpha represents the chance the researcher is willing of being wrong. For example, a .05 cut-off level indicates a 5 % chance of rejecting a true null hypothesis (Pallant, 2010). The beta coefficient shows the unique contribution of each of the independent variables. A beta coefficient of .5 indicates that for each unit increase in the independent variable, the dependent variable will increase by .5 units (Pallant 2010).

Multiple regression makes a number of assumption about the data being analyzed. Assumptions should be tested for each of the variables, and for the variate as a whole. The sample size must be sufficient, with a desired level of at least 5 observations for each independent variable. This concept is referred to as degrees of freedom, which is the total number of observations minus the independent variables + 1 (Hair et al. 2014). The larger the degrees of freedom, the more generalizable the results obtained from the analysis are.

Multicollinearity is another important assumption, which considers the relationship between the independent variables. More specifically, multicollinearity occurs if one independent variable consists of a combination of other independent variables, which affects the interpretation of the individual predictors (Pallant, 2010). To pick up on such problems, two coefficients are of specific interest: Tolerance and variance inflation factor (VIF). Tolerance indicates how much of the variability of the independent variable is not explained by other variables. If the Tolerance value is very small (below .10), it indicates the possibility of multicollinearity (Pallant, 2010). VIF is just the inverse of the Tolerance value, denoting how much of the variability of the independent variable is explained by the other variables in the regression. VIF values above 10 are of concern for the researcher, as it indicates too high multicollinearity (Pallant, 2010). As multiple regression is very sensitive to outliers (very high or very low scores), it is important to check for extreme values in the data screening process (Pallant, 2010). Standardized residual values above 3.3 or less than -3.3 are considered outliers, according to Tabachnick and Fidell (2007).

4.5 Reliability and validity

Before analyzing the findings, it is important to test the validity and reliability of the research. As previously mentioned, the presented study has combined qualitative and quantitative methods. According to Patton (2002), triangulation strengthens the findings by acquiring a more profound understanding of the research topic. Hence, the methodological approach to this study may improve the reliability and validity of the findings (Patton, 2002).

4.5.1 Reliability

Reliability refers to the extent to which the data collection technique generates consistent findings (Saunders et al. 2009). The reliability is high if repeated analysis yields similar results. Measurement errors will always occur in scientific studies (Saunders et al. 2009). In qualitative research, errors might include the possibility of taking irrelevant notes or omitting important facts. In addition, the interviewees may provide false information, by only saying what their supervisors wants them to say. According to Saunders et al. (2009), measurement errors might also occur due to observer bias. This entails that there are different ways of asking questions in qualitative research, and interpreting the replies. To reduce the possibility of observer bias, and increase reliability of the interviews, the candidates used similar questions as Yam et al. (2004). Furthermore, two tape recorders were used in all three interviews. This enabled the cadidates to retrieve flawless recordings, and discuss the implications of the responses.

Wilson (2006) explains how reliability in quantitative research relates to the consistency of the scales applied. There are two ways to measure the reliability of scales, but only one is applicable in this study. The test-retest reliability examines the stability of scale items over time. However, due to the time aspect of the study, this test was impossible to conduct. This indicates that the presented study is cross-sectional, and is based on the circumstances at one specific occasion (Wilson, 2006). The reliability test conducted in this research is the split-half reliability test, which measures the internal consistency of the scales. This is done by presenting and discussing the Cronbach´s alpha coefficient. In short, the coefficient indicates to what extent the items of a scale are all measuring the same underlying attribute (Hair et al. 2014). Ideally, the alpha value should be above .7 (Hair et al. 2014).

4.5.2Validity

Validity refers to the degree in which a measure accurately represents what it is supposed to (Hair et al. 2014). There are two main types of validity: internal and external validity (Saunders et al. 2009). Internal valdity is defined as the ability to make precise predictions about causal realtionships. External validity is refferd to as genralizabiliy, and depicts whether the findigs can be conveyed from one group to another (Saunderset al. 2009). Thus, external valididty is most relevant for the

quantitative part of this study. Reliability and validity are complementary, indicating that high reliability is a prerequisite for high validity (Wilson, 2006).

In the qualitative part of this study, internal validity is influenced by how we gather and interpret information. To ensure good internal validity, all respondents received transcripts of the interviews. As a consequence, the respondents were able to revise and confirm their answers. In terms of external validity, we have selected one specific industry in Norway. From this industry we selected three different companies, based on turnover. Thus, the candidates were able to cover different size-groups and compare similarities and differences between the companies.

Furthermore, selection of industry is especially important for the external validity of the quantitative findings. By investigating one homogenous sample, it is likely that the responses reflect that of the population. The total population of interest consists of 169 companies, from which 75 firm responses were retrieved. Hence, this study achieved a sample accounting for 44% of the targeted population (before screening and cleaning). This implies that some generalizations can be made about the population. Nevertheless, generalization of the findings should be taken with caution (Hair et al. 2014).

Other central factors for ensuring good research quality, is the evaluation of content and construct validity (Hair et al. 2014). Content validity refers to the subjective, yet systematic, assessment of how well the scales measure the topic of interest. The objective is that the items used in the research represent all the dimensions of the underlying construct. Wilson (2006) argues that pre-testing the questionnaire on experts can ensure high content validity. As discussed in part 4.4.1, industry experts reviewed all questionnaire items, indicating good content validity (Wilson, 2006). However, this type of evaluation is very subjective, and should be supplemented with other evaluations of validity (Wilson, 2006). On the other hand, construct validity concerns the theoretical justifications of the various items in a scale (Wilson, 2006). As seen in figure 4, each of the independent variables consists of 3-4 theoretically founded indicators. Similarly, firm performance and cluster interaction are measured by several items. Overall, this increases the construct validity of the study. However, the fact that firm size is measured by only one variable (number of employees) might serve as a point of criticism.

5.0 Results and analysis

The following chapter will present and analyze the results obtained from the qualitative and quantitative research. The chapter is divided into two parts. The first part presents the main results obtained from the preliminary interviews with Seaonics, Rolls Royce Marine and Sperre industri. Then, the second part analyzes the data obtained from the industry survey.

5.1 Qualitative results

The following section will emphasize the results believed to be most important to answer the proposed research questions. This part will also highlight differences and similarities between the three suppliers. As the respondent firms in the qualitative study might be unknown for readers outside MR, a short introduction of the firms is necessary.

Seaonics

Seaonics is a subsidiary of VARD Group AS, which holds a 51% equity stake in the company. Today, Seanoics specializes in the design and manufacturing of offshore handling equipment. Their products are used in subsea construction, module handling, well intervention, reservoir exploration and ocean trawling[19]. Seaonics has a total workforce consisting of 41 employees. In 2014 the company had a turnover of NOK 159 million, generating a negative result of NOK 29 million[20]. Our respondent at Seaonics was operation manager, Sindre Walderhaug.

Rolls Royce Marine

Rolls Royce Marine, further referred to as Rolls Royce, is a leading supplier of integrated power and propulsion systems. The company´s key area of expertise is the development of technologically complex systems for offshore oil and gas production, naval surface and submarine vessels[21].The company has around 400 employees in Ålesund. Rolls Royce had a turnover of NOK 8,4 billion in 2014, generating a negative result of NOK 314 million[22]. Our respondents at Rolls Royce were engineering and

[19] https://www.seaonics.com/page/about_us/
[20] http://www.proff.no/selskap/seaonics-as/ålesund/offshoretjenester/Z0I6RVS8/
[21] http://www.rolls-royce.com/products-and-services/marine.aspx
[22] http://www.proff.no/selskap/rolls-royce-marine-as/ålesund/skipsbyggerier-og-verft/Z0INI9IX/

technology director, Svein Kleven and PhD candidate Oda Ellingsen.

Sperre Industri

Sperre is a privately owned family company located at the island of Ellingsøy, just outside Ålesund. The company has designed, manufactured and delivered compressors and coolers for the maritime industry for more than 75 year. The main objective of the firm is to deliver state-of-the-art systems with the lowest possible life cycle costs. Today, roughly three out of four vessels rely on starting air from Sperre[23]. The company has a current workforce consisting of 90 employees. In 2014, Sperre achieved a record-high turnover of NOK 288 million. This resulted in a positive operating profit of NOK 27 million[24]. Our respondent at Sperre was product developer, Nikolai Bjørge.

How does the management evaluate technological trends relevant for the company?

Sindre Walderhaug at Seaonics explains how the board and the management contribute to the evaluation of technological trends. The management forecast how their customers modify vessels by trend studies. This approach has led the company to develop products that follows today's rapid market change.

The management in Rolls Royce uses systematic methods when investigating short and long-term trends, according to Svein Kleven. Furthermore, the company applies SWOT analyses to evaluate competitor's strengths, weaknesses, opportunities and threats. Rolls Royce also conducts several depth-analyses, were intellectual property rights and patent searches are the main area of interest.

Nikolai Bjørge at Sperre explains how the development of highly diversified products relies on close corporation between the development department, the sales department and the customers. Bjørge also maintains that the most interesting emerging trends in the market are related to automation and control opportunities. Hence, the company works actively to be in the forefront of these developments.

[23] http://www.sperre.com/about-sperre
[24] http://www.proff.no/selskap/sperre-industri-as/ellingsøy/pumper/Z0I41D8U/

Does the company collaborate with other actors to identify opportunities in different market segments?

Seaonics cooperates with both downstream suppliers and upstream customers. Furthermore, close cooperation has enabled the company to identify market opportunities. Recent market developments have led the company to shift focus from the offshore segment towards the fishing fleet. In 2014, almost 80% the company´s activity was related to the offshore production. Today, approximately 90% of all contracts involve the delivery of handling solutions to fishing and science vessels.

" We are a small company, so it is easier for us to readjust than it is for large companies", Sindre Walderhaug maintains.

Rolls Royce collaborates with different universities in order to identify future technological trends. Accordingly, they use forskningsrådet, innovasjon Norge, maritimt forum and mørebenken. Svein kleven explains that it is important for Rolls Royce to participate in different project. By doing this, the company is present in the development of important technological fields. The cluster cooperation between suppliers, shipyards and ship-owners has traditionally been focusing on extracting new ideas and testing them in the field.

Sperre cooperates with another compressor supplier to offer complete solutions for start-air and work-air on board vessels. The company also hired consultants in the development of their new x-range compressors. In addition, Sperre cooperates with local universities to get academic input regarding the technological development of the industry.

How would you evaluate the company's capability to adapt technology to match market needs?

Seaonics and Sperre are relatively small companies that can easily readjust to market conditions when necessary. Both companies focus on current needs in the market, but have a proactive approach to develop their technological base. Bjørge explains how Sperre has increased its position in the liquefied natural gas (LNG) and marine market. In addition, Sperre has several contracts for land-based power stations. This is important for the company, due to the decreased activity in the offshore segment.

Representing a significantly larger company, Rolls Royce has a thorough plan when it comes to readjustment of technology. The company is continuously working to change the market by offering new technology unknown for the customers. Rolls Royce does this by implementing formal plans for future technology development, stretching 5-10 years. In addition, the company generates 3-5 years plans for product development. Oda Ellingsen explains how these plans are the means in which the company verifies the current technology within the organization.

To what extent does the company take into account customer feedback in the development of new products and/or services?

All of the respondents argue that their company considers customer feedback in the development of new products or services. However, their focuses are different. Seaonics uses customer feedback in the form of close communication to develop strong relationships in the innovation process. On the other hand, Sperre works continuously to satisfy their customers by analyzing claims on products, and evaluating changes in product demand. Rolls Royce uses their customers to test out new ideas. By increasing the amount of feedback used in product development, Rolls Royce's general perception among their customers will be improved. Due to the downturn in the offshore industry, there are fewer resources among their development partners. Consequentially, Rolls Royce has increased their allocation of funds to internal development projects, where they can decide themselves the level of customer interaction.

What policy does the company have regarding the allocation of funds for development of new products and/or services?

Established in 2011, Seaonics is a rather new company. Sindre Walderhaug explains how the company is still in an establishment phase, and relies heavily on innovation. Hence, almost everything the company does is related to product development. Sperre is devoted to allocate sufficient funds to the development of their compressors and coolers. Even though the company does not possess unlimited capital, the management maintains that the firm should be in forefront of product development. Rolls Royce varies their capital expenditures to the different technology and product areas.

With this, the company prioritizes their product strategies, depending on the relative importance of the different projects.

Approximately, what percentage of the company´s employees works with development of new products and/or services?

Sindre Walderhaug at Seaonics states that approximately 78-80% off all employees works with product development. Sperre has two employees working full-time with product development. In addition, the company has one electrical engineer and one mechanic that provide assistance when needed. At Rolls Royce, 20 % of the staff works with product development. Furthermore, the company has a certain proportion of engineers working on maintaining and upgrading the existing products.

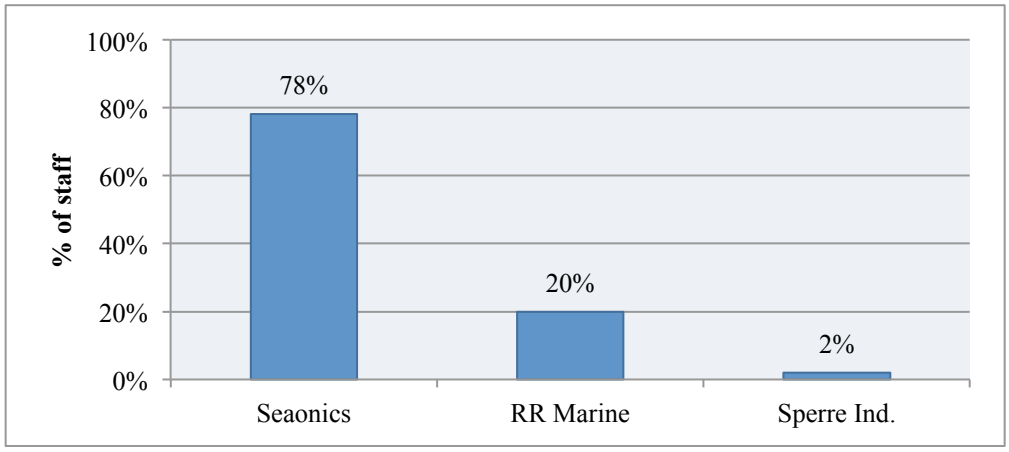

Figure 7: *Percentage of staff working with product/ service development*

Which requirements does the company have regarding the level of education and work experience for employment in the various departments?

Sperre, Seaonics and Rolls Royce all argue the importance of employing the right person with the right qualifications, for the right position. However, none of the companies have any formal policy specifying a required level of education.

According to Sindre Walderhaug at Seaonics, it is imperative to recruit people with experience that might be valuable for the company. He explains how Seaonics has no hiring policy that indicates a minimum amount of work experience. Instead, the company is focused on finding complementary skills that are needed in the company.

Rolls Royce focuses on recruiting individuals with the highest potential. Svein kleven argue that formal education is most important the first 3-5 years in a career. After this, the ability to obtain new knowledge and skills is decisive for high job performance. Sperre, on the other hand, is known for little employee turnover. Most of its employees have been working at the company for years, and have profound experience in their areas of expertise.

Does the company offer courses and further education to the employees?

Both Sperre and Seaonics offer courses in handling computer software, to their employees. These courses are necessary for the staff to perform their job in the best possible way. Similarly, Rolls Royce strives to stimulate learning through courses and education. However, engineering and technology director Svein Kleven argues that programs offered by external providers are not always optimal for the firm. Consequently, the company focuses on internal training, and has established its own "Rolls Royce Academy". This allows the company to specialize education and training of the employees, without relying on external providers.

How does the company implement efficient methods of production?

Seaonics outsource all their production to Eastern Europe. The company has continuous contact with its suppliers, which are all well known within the industry. By creating a sense of mutual trust, Seanoics can actively work together with the suppliers to implement efficient methods of production, according to Sindre Walderhaug. However, one of the main challenges for the company is that they are constantly producing new products. Hence, it is important for Seaonics to have suppliers that can quickly adapt to new product requirements.

Rolls Royce regularly evaluates what to produce in-house, and what part of the production needs to be outsourced. Svein Kleven explains how the company considers the different product portfolios to ensure that they have optimal efficiency at their sites. Rolls Royce relies on significant activity in high-cost countries, due to quality specifications. Thus, the company is always looking for opportunities to use new robot and material technology to ensure a more efficient production. Svein Kleven believes that the maritime cluster in MR has outsourced too much of its production, while

maintaining only advanced assembly in Norway. Instead, the focus should be on increasing the investments in advanced production technology.

"The shipyards have done this by starting to outsource sections, then whole modules, then complete hulls. If we are going to continue as production cluster, we have to start using new production technology while executing standardized tasks", he says.

Sperre have most of their production at Ellingsøy, in a partly automated manufacturing site. Their plant consists of a combination of operators and robots to ensure an efficient production. Furthermore, Sperre conducts fully automated night shifts, in order to meet market demands. Nikolai Bjørge argues that efficiency in production is one of Sperre´s main advantages. The company can deliver new parts to their customers within 48 hours. In addition, they have a 30-year availability guarantee of all compressor parts.

How does the company implement quality control throughout the value chain?

All companies stated that they implement quality control throughout their supply chain. Of particular importance is the control of output produced by subcontractors. This is important since all of the respondent firms are producing products and solutions that are vital for the safety of vessels. Nikolai Bjørge explains how Sperre tests their compressors along every step in their production line. They also provide final inspections and service on board their customers´ vessels. Rolls Royce initiates several filters of quality control throughout the value chain, to ensure that safety and quality specifications are meet. However, Svein Keleven states that *"to implement a quality control system, sometimes requires a cultural change and I think we, like everyone else, have some challenges".*

How would you evaluate the company`s capability to develop a project from R&D to commercial production?

Both Seaonics and Rolls Royce are relatively pleased with their ability to develop a project from R&D to commercial production. Sindre Walderhaug maintains that Seaonics is too small to enjoy scale benefits, but he is very satisfied with their ability to create feasible prototypes. On the other hand, Svein Kleven at Rolls Royce believes that the company´s main challenge is to increase the speed of development. Today, the process from prototype to full-scale production relies on good collaboration between

shipyards and ship-owners, due to large capital outlays. Consequentially, Rolls Royce might benefit from more independent laboratory tests. Sperre are mainly focused on monitoring and improving existing products. The company delivers approximately 2000 compressors per year, and it is a challenging and time-consuming process for them to introduce product modifications.

How does the company maintain good relationships with its customers?

Seaonics have a department consisting of 10 employees, which works with customer service and aftermarket relations. As off February 2016, the company´s workforce will increase with 50 employees. As many of these are service engineers, this will become an additional contribution to the customers, according to Sindre Walderhaug. Similarly, Rolls Royce has a customer relationship management organization. This organization assigns a key account manager to each of the most important customers. Furthermore, the company stores information about customer requirements in their customer relationship management (CRM) system. Sperre uses their worldwide network of agents to maintain customer relations. In addition, the company has offices with sales representatives in Singapore, Shanghai and Rotterdam. Nikolai Bjørge argues that this approach has the advantage of bringing the company closer to its customers.

Does the company measure customer satisfaction? If so, how do you obtain this information?

Both Seaonics and Rolls Royce have a systematic approach to measure customer satisfaction, and conducts surveys on current and potential customers. Sindre Walderhaug at Seaonics explains that their customers vary in terms of required product features. Shipyards are interested in price and installation costs. On the other hand, ship-owners are primarily concerned with lifecycle costs and value creation. This underlines the importance of tracking customer satisfaction. In addition to regular surveys, Rolls Royce offer exclusive customers accelerated quality programs. When needed, the company accommodates important customers with a team of engineers to solve potential problems quickly.

Sperre has no formal approach to measure customer satisfaction. Instead, the company is a member of incentra, an umbrella organization for ship-owners and maritime suppliers. Member firms are required to fulfill certain criteria's related to product quality and safety[25]. A survey conducted by incetra ranked Sperre highest of all maritime suppliers in regards to customer satisfaction.

Customer Satisfaction	YES	NO
Seaonics	**X**	
Rolls Royce	**X**	
Sperre Ind.		**X**

Table 5: *Overview of companies measuring customer satisfaction*

How would you characterize the company's reputation? And how is this reputation compared to your nearest competitors?

As previously mentioned, Seaonics is a relatively new company and is still working to establish their brand. However, the company is receiving good feedback from customers regarding product quality and functionality. Hence, Sindre Walderhaug is optimistic about the firm´s future image as a quality supplier of maritime handling solutions.

There is no doubt that Rolls Royce is a strong brand name. Nevertheless, much of the company´s image as a high quality supplier is due to their strong position in the aviation industry. According to Sindre Kleven, the company´s reputation within the maritime industry is more at pair with other suppliers. Feedback from customers indicates that the company´s advantage lies in its ability to find solutions to complex issues through cooperation and dialogue.

Sperre has a very good reputation within the maritime industry. Nikolai Bjørge argues that the company´s punctuality is the main reason for this. In the case of an emergency, the company guarantees delivery of spare parts within 48 hours. The compressors and coolers offered by Sperre are important components on board vessel. With this, the

[25] http://incentra.no/agreements/about-incentra-sa/

company has an above average focus on product quality and safety, which contributes to the development of a strong reputation, Bjørge maintains.

How does the company communicate with its suppliers?

All three companies have their own department that handles communication throughout the supply chain. The main focus of these departments is to maintain good relations with the suppliers, and to make sure that product and delivery specifications are met.

As a supplier of advanced power and propulsion systems, Rolls Royce is dependent on an immense network of sub-suppliers. Svein Klevens states that*" It is often too risky to deal with only one supplier. Therefore, we try to have at least three major suppliers for each component. We are constantly communicating to these suppliers what our expectations are in terms of quality and internal control"*.

Sperre has its own purchasing department that negotiates the conditions of delivery with the suppliers. In addition, company representatives have regular meetings with suppliers to readjust agreements when necessary. Sperre have historically produced most components in-house. However, the company has recently started to outsource the production of stamps to the machine department.

Does the company measure the performance of its employees?

Seaonics measure the performance of individual employees and entire teams. The company does this by identifying key performance indicators (KPI), such as product defect rates, sales figures and cost reduction. However, this system is still under testing and needs additional improvements to work optimal, according to Sindre Walderhaug. Similarly, Nikolai Bjørge at Sperre underlines the company´s focus on continuously monitoring individual and collective performance.

Rolls Royce measures employees' performance and compare this to monthly targets. Each department has a manager that specifies objectives for the different teams. These managers are responsible for the collective performance of their team, and report directly to the top-management. Furthermore, Rolls Royce identifies career plans for

each employee to stimulate long-term performance. This approach encourages the workers perform at a maximum level, according to Svein Kleven.

Does the company benchmark its performance against competitors or other relevant actors?

Sindre Walderhaug maintains that Seaonics measure important performance indicators for the firm, and compare these to other industry actors. Likewise, Rolls Royce focuses on different aspects of organizational performance when benchmarking against competitors. Of particular importance are productivity, costs and sales figures.

Nikolai Bjørge describes how Sperre evaluates competitors continuously. The company reviews cost and price specifications of orders granted to other maritime suppliers. Furthermore, Bjørge explains how the company occasionally has to accept a selling price below production cost, in order to maintain its market share.

How does the company identify external opportunities and threats?

Seaonics has a group of employees that works with market analysis. These employees have to be updated on what the competitors are doing, and what technological trends are emerging in the market.

Being one of the largest companies in the industry, the identification of external opportunities and threats occurs at several organizational levels at Rolls Royce. Product managers are responsible for the long-term profits of different offerings. Thus, each manager has the responsibility to recognize changes in the market, and make suggestions for product improvements. Furthermore, Svein Kleven maintains that Rolls Royce is constantly evaluating the technological and strategic development of their competitors.

Similarly, Sperre identifies opportunities by evaluating the strategy of other maritime suppliers. Hence, market opportunities identified by competitors might be prosperous for Sperre as well. Nikolai Bjørge argues that the biggest threats facing the company are differences in governmental regulations and cultural bias. However, the company has incorporated formal procedures to deal with these challenges.

Does the company implement strategic plans using quantitative objectives (e.g. balanced scorecard)?

Seaonics identifies measurable objectives for all of their departments. However, Sindre Walderhaug claims that long-term goals are more important than the short-term performance. The company has experienced a proportional increase in revenues the last four years. However, the recent year has been tough for the company due to decreasing demand in the offshore segment. Hence, the company is adjusting their objectives to match a highly volatile demand, according to Walderhaug.

Rolls Royce establishes quantitative objectives on a yearly basis. These objectives are related to expected turnover, profits and cost levels. Moreover, the company communicates these objectives throughout the organization. This way, each employee can contribute to the common good of the organization. If the performance is off target, the management in Rolls Royce makes necessary adjustments, maintains Svein Kleven.

Sperre has its own project team that establishes organizational objectives. These goals are then communicated to each of the relevant departments. Strategic plans are created with a long-term perspective, according to Nikolai Bjørge.

How does the company communicate its core values to the employees?

Seaonics communicate the company´s core values to the employees regularly at evaluation meetings. In addition, value statements are available in different brochures at the office. Similarly, Sperre has a set of core values that are communicated to the employees at staff meetings.

Rolls Royce communicates its core values to each employee in the beginning of their tenancy. Furthermore, the employees receive brochures and value statements annually. Svein Kleven explains how Rolls Royce runs a number of workshops with different scenarios and role-plays. In between these big workshops, the company conducts in-depth training by smaller courses or Internet exercises. Thus, Rolls Royce emphasizes the communication of the firm´s core values to the employees, in to order change the organizational culture in a positive way.

How would you evaluate the company's product and/or service quality compared to our nearest competitors?

Sindre Walderhaug claims that Seaonics offers considerably higher product quality than their competitors. Nevertheless, the quality of their products varies to some degree between different market segments.

Svein Kleven at Rolls Royce admits that the company´s response time is not always sufficient. However, Kleven argues that the company delivers high quality solutions that customers can depend on. Benchmarking conducted by Rolls Royce indicates that the company is better than their competitors in regards to product quality, according to Kleven.

The products and services offered by Sperre have significantly better quality than that of their competitors, Nikolai Bjørge maintains. Nevertheless, the company´s products are relatively expensive compared to other suppliers in the industry. This is because Sperre produce all of their compressors and coolers in Norway, which leads to a high sales price.

Has the company launched any products and/or services in the past five years, representing a significant technological innovation?

Seaonics have launched products that are completely new to the industry. The most significant innovations were the launch and recovery systems, and the introduction of "Seaonics moonpool". These products have improved the efficiency of lifting operations, according to Sindre Walderhaug. Rolls Royce´s most significant innovations have been in the after-sales service segment. The company has introduced adapted monitoring systems. By doing this, the company is able to offer their customers a certain amount of operating hours for each product. Sperre introduced their new X-range compressor in 2010. The product offered a number of innovative and improved features needed in the industry. Specifically, the X-range presented increased efficiency to the field of specialized compressors. In addition, the product covered both air and water-cooling on board vessels.

Norway ranks low on traditional measures of innovation, despite having high productivity and growth. This phenomenon is called the "Norwegian paradox".

What do you think are the main reasons for this paradox?

Sindre Walderhaug at Seaonics maintains that cultural factors and industry clusters are the main contributors to the Norwegian paradox. The maritime cluster in MR serves as a good example. In this cluster, there is no need for much basic research to generate ideas. Instead, network connections and informality take ideas forward. In addition, companies can communicate and collaborate with each other easily. The high competition between companies also facilitates innovation and development, Walderhaug claims.

Svein Kleven at Rolls Royce believes that there are several obvious explanations for this paradox. The company participates in a number of EU regulated research programs with high capital outlays, and several smaller national programs subsidized by the Norwegian Research Council. Kleven argues that EU initiatives are associated with high administration costs, and involve too many organizations. On the other hand, Norwegian projects are more efficient in the development of new technology. The key reasons for this are low administration costs and a limited amount of project partners. Furthermore, Norwegian companies are known to take higher risks, and are more willing to present prototypes at an early stage. However, the paradox can be viewed from another perspective. Even though Norwegian companies achieve high performance compared to R&D expenditures, allocating more funds to fewer programs could increase innovation further. This may boost the quality of programs that require more resources, Kleven maintains.

Nikolai Bjørge at Sperre underlines similar reasons for the paradox. Norwegian manufacturers have a long tradition of advanced production, and the development time from idea to commercialization is much shorter than in other countries. Companies in Norway are also highly interrelated, especially in western Norway where everything is in close geographical proximity. Short distances and continuous dialogue with other actors is what stimulates innovation in this cluster and the entire country, according to Bjørge.

5.2 Quantitative results

This part of the chapter analyzes the results obtained from the survey of maritime equipment suppliers located in MR. First, descriptive statistics of the respondent firms will be presented, followed by a factor analysis to confirm key constructs in the study. In order to accept or reject the research hypothesis, multiple regression analyses will be conducted in the latter part of the chapter. IBM´s Statistical Package for the Social Sciences (SPSS) was used to conduct all of the statistical analyses.

5.2.1 Descriptive statistics

After screening and cleaning the data, a sample size of 74 full responses was achieved. This gives a relative high response rate of 43,7%. Furthermore, the sample size is sufficient to conduct reliable multivariate analyses (Hair et al. 2014; Pallant, 2010; Wilson, 2006). Figure 8 shows the distribution of organizational position for the respondents.

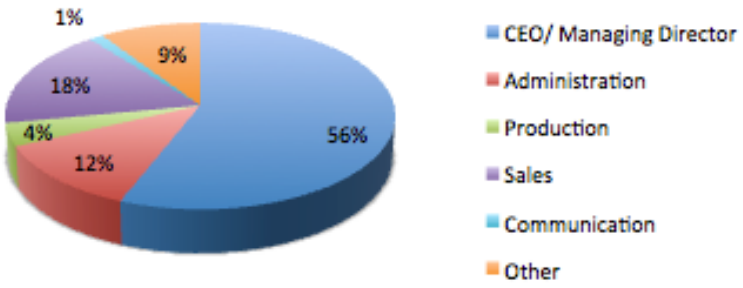

Figure 8: *Organizational position of respondents*

As illustrated by the sector diagram, over half (56%) of the respondents were CEO´s or managing directors of the company they represented. Further, 13 (18%) of the respondents worked with sales, while 9 (12%) of the respondents worked with administration. Production, communication and "other" accounted for 4%, 1% and 9 % of the respondents, respectively. As the majority of respondents worked with top-level management or sales, it is reasonable to assume that they were sufficiently qualified to answer the survey.

All of the 74 respondents disclosed which municipality their company belongs to. As seen in figure 8, the five municipalities that stood for most of the respondents were Ålesund (29,33%), Molde (17,44%), Kristiansund (10,67%), Ulstein (9,33) and Vestnes (6,67%). Collectively, these municipalities account for 73,44% of the entire sample.

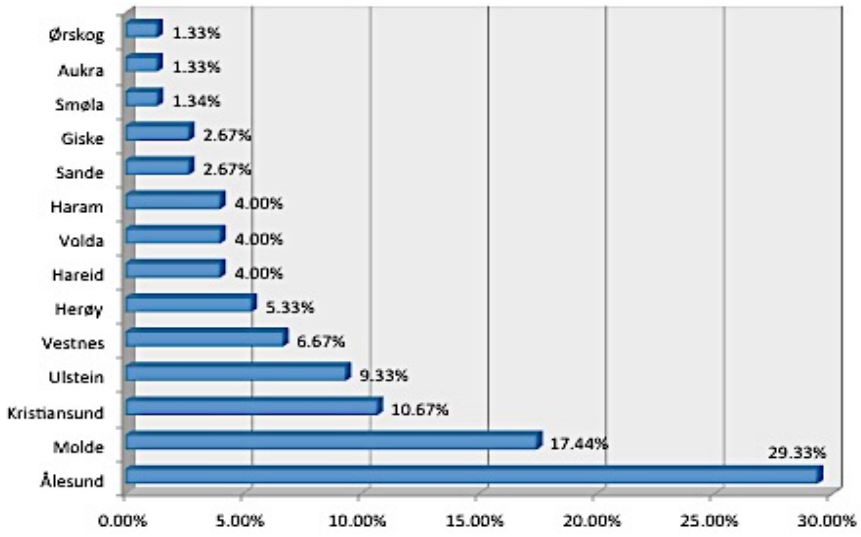

Figure 9: *Geographical distribution of sample*

Important characteristics of the respondents can also be identified through several of the continuous variables used in the study. Of particular interest is firm size, turnover, percentage of employees working with R&D, and innovation ratio. Table 6 presents descriptive statistics for the mentioned variables.

	N	*Minimum*	*Maximum*	*Mean*	*Std.*	Skew.	Kurt.
Turnover 2014	74	13734	8432297000	239947909,9	982889331,3	8,154	68,6
Change turnover in % from previous Year	74	-60	200	12,3444	38,95570	2,270	7,19
Number of employees	74	1	2000	68,0541	234,8211	7,866	65,05
Percentage of employees working with R&D	74	0	100	23,00	28,7473	1,558	1,391
Percentage of product/service the last three year representing innovations	74	0	100	28,4189	29,75102	.270	.445

Table 6: *Turnover, firm size, R&D employment and innovation ratio*

The 74 suppliers had an average turnover of NOK 239 million in 2014. However, the standard deviation is very high, indicating that some outlier cases (e.g. very large companies) inflate the mean value. Correspondingly, the skewness and kurtosis values suggest a rather peaked distribution with scores clustered around low values. With this, the median might provide a more "realistic" measure. The median turnover for the suppliers were NOK 51,6 million. Further, the mean value of change in turnover is 12,3, indicating that the average firm had a 12,3% increase in turnover from the preceding year. Number of employees ranges from 1 to 2000, with the average firm having 68 employees. Percentage of employees working with R&D had a mean value of 23, implying that roughly one out of four employees works with R&D-related activities. The last column displays new products/services offered by the firm the last three years, representing innovations. The mean value show that, on average, 28 % of the firms' products/services the last three years represents new launches or significant technological innovations.

The last part of the survey contained questions aimed to measure cluster interaction among the firms. The respondents were asked which actors (local, national or international) are most important for their company in general. This question was included to examine how dependent the firms are on local actors (e.g. customers, suppliers, institutions, etc.) within the cluster, contra actors external to the cluster. Figure 10 illustrates that 29 (39,20%) of the respondents stated that international firms are most important for their company. On the other hand, local firms and national firms were rated as most important among 27 (36,5%) and 18 (24,30%) of the respondents, respectively. While figure 10 gives an overview of the most important actors for the respondent firms, figure 11 illustrates the importance of collaboration between local actors within the cluster. Out of the 74 respondents, as many as 51 (68,9%) claimed that collaboration between local actors is either very or

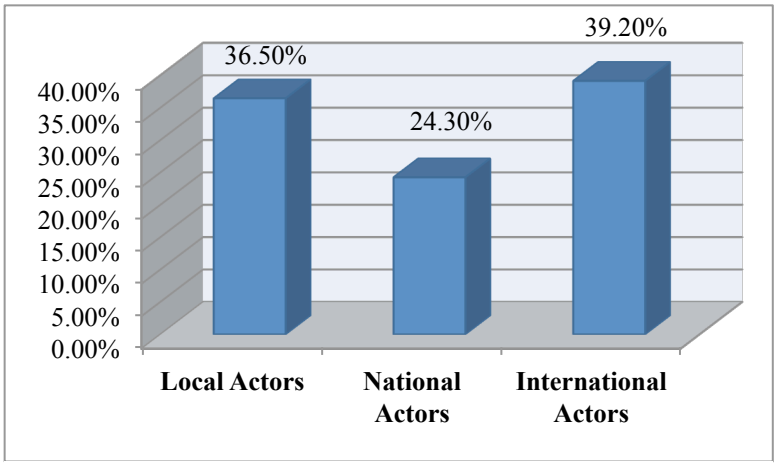

Figure 10: *Most important actors for the firm*

extremely important for the innovative capability of the firms within the cluster. On the other hand, only 23 (31,1%) of the respondents stated that collaboration between local actors is somewhat, moderately, or not important for the innovative capability of the firms within the cluster.

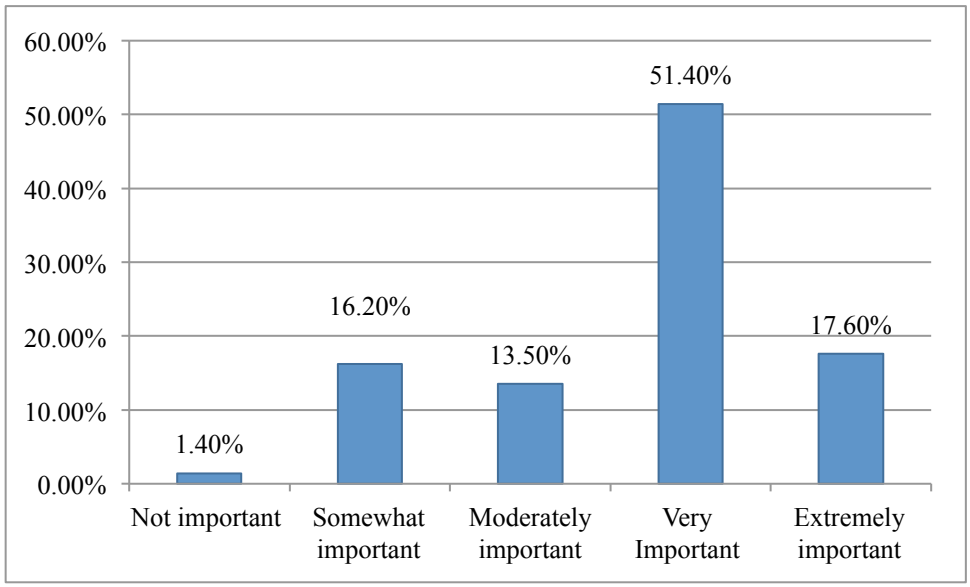

Figure 11: *Importance of collaboration between local actors*

The statistical techniques conducted in this study assume that the distribution of scores on the dependent variable is "normal" (Hair et al. 2014). Appendix 7 contains Kolmogorov-Smirnov´s test of normality for the variables comprising firm performance. A non-significant result (Sig value > *.05*) indicates normality. In this case, the sig value for all of the variables are below .05. Thus, the assumption of a normally distributed dependent variable is violated. However, Pallant (2010) argues that non-normal distribution is quite common, especially in social sciences. This view is shared by other academics, such as Box (1976), who claims that data collected in an organizational context seldom are normally distributed. The reason is that scientific data aims to describe " the real world", which often holds skewed relationships (Box, 1976). This indicates that presented statistical analysis are appropriate, despite a non-normal distribution of the dependent variable.

5.2.2 Factor analysis

This thesis aims to investigate whether TICs significantly influences firm performance, and whether organizational size and cluster interaction moderates this link. In order to answer these questions, confirmatory factor analyses (CFA) were conducted to make sure that the items suggested by the study measures the correct concepts. As illustrated in our research model (Cf. figure 4), there are a total of 9 concepts that needs to be transformed into summated scales. Firm size is not included in the factor analyses as it consists of one variable (number of employees). A vast amount of output from SPSS is generated when conducting factor analysis. However, the candidates choose to include only the most relevant output from each of the factor analyses in appendix 8.

5.2.2.1 Learning capability

Learning capability was measured through the following items:

V7: Firm´s capability to assess trends relevant for the company

V8: Firm´s capability to adapt technology to match market needs

V9: Firm's capability to collaborate with other actors to identify opportunities in different market segments

The results show that the Kaiser-Meyer Olkin Measure of Sampling Adequacy (KMO) is .668 and that Barlett´s test of sphericity is significant (P = 0.000), indicating that there is enough correlation among variables for a useful factor analysis (Appendix 8a). In addition, the analysis reveals that one component meets Kaiser´s criterion with an eigenvalue over 1, explaining 74,8% of the total variance. All of the factor loadings are well above the suggested .4-minimum (Pallant, 2010). Collectively, this demonstrates the variables suitability for measuring learning capability. Table 7 summarizes the main results from the analysis.

Variable	**Factor loadings**
V7: The firm´s capability to asses trends relevant for the company	***.917***
V8: The firm´s capability to adapt technology to match market needs	***.874***
V9: The firm`s capability to collaborate with other actors to identify opportunities in different market segments	***.800***
KMO: .668, Bartlett´s test of Sphericity: P=. 000	
Total variance explained: 74,8%, Cronbach´s alpha: .826	

Table 7: *Factor analysis learning capability*

The internal consistency (reliability) of the scale was tested through the Cronbach´s alpha coefficient. In this case, the Cronbach´s alpha value is .826, indicating very good internal consistency. By looking in the column headed "Alpha if Item Deleted" (Appendix 8a), we see that removing variable 9 would increase the alpha value to .854. Still, Hair et al. (2014) argue that summated scales should preferably contain at least 3 items (variables). Consequently, all of the variables are included to measure the concept of learning capability.

5.2.2.2 R&D capability

The following items measure R&D capability:

V10: Firm´s capability to invest sufficiently in the development of new products and /or services

V11: Firm´s capability to efficiently communicate R&D activities across the various departments

V12: Firm´s capability to apply customer feedback in technology development

V13: Firm´s capability to specify clear goals and plans for research projects

The results from the second CFA (Appendix 8b), reveals several important findings. The KMO value is .826 and Bartlett´s test is statistical significant (P=. 000), indicating the suitability of a factor analysis. The analysis also reveal that one factor can be extracted, accounting for 72,2% of the total variance. Investigation of the component matrix, indicates that the factor loadings are all well above the suggested minimum. Table 8 provides an overview of the most important findings from the second factor analysis.

Variable	**Factor loadings**
V10: firm´s capability to invest sufficiently in the development of new products and/or services	***.855***
V11: The firm´s capability to efficiently communicate R&D activities across the various departments	***.886***
V12: Firm´s capability to apply customer feedback into technology development	***.787***
V13: Firm´s capability to specify clear goals and plans for research projects	***.868***
KMO: .826, Bartlett´s test of Sphericity: P=. 000	
Total variance explained: 72,2%, Cronbach´s alpha: .871	

Table 8: *Factor analysis R&D capability*

Through a reliability analysis we retained a Cronbach´s alpha value of .871, which is well above the recommended threshold. There are no questions that can be deleted to increase the internal consistency of the scale.

5.2.2.3 Resource capability

The following items measures resource capability:

V14: The firm´s capability to employ qualified staff to the various departments

V15: The firm´s capability to allocate adequate resources for courses and further education of employees

V16: The firm´s capability to allocate adequate resources for the development products and systems

The main results from the third factor analysis is presented in table 9:

Variable	**Factor loadings**
V14: The firm´s capability to employ qualified staff to the various departments	***.848***
V15: The firm´s capability to allocate adequate resources for courses And further education of employees	***.879***
V16: The firm´s capability to allocate adequate resources for the Development of products and systems	***.866***
KMO: .720, Bartlett´s test of Sphericity: P=. 000	
Total variance explained: 74,7%, Cronbach´s alpha: .831	

Table 9: *Factor analysis resource capability*

The analysis resulted in a KMO value of .720, and a significant Bartlett´s test (P = .000). This indicates that the data is suitable for measuring resource capability. Using Kaiser´s criterion, we observe that one component has an eigenvalue above 1, explaining 74,7 % of the variance. An inspection of the component matrix (Appendix 8c) reveals that all items have high factor loadings. This further supports the notion that the items truly measure the proposed construct. The reliability analysis revealed a very good internal consistency, with a Cronbach´s alpha of .831. In addition, no items can be deleted to increase the alpha value (Appendix 8c).

5.2.2.4 Manufacturing capability

The concept of manufacturing capability is measured through four items:

V17: The firm´s capability to implement efficient methods of production

V18: The firm´s capability to develop a project from R&D to commercial production

V19: The firm´s capability to implement quality control throughout the supply chain

V20: The firm´s capability to generate feasible product development ideas

The output generated by the analysis is found in appendix 8d, while table 10 summarizes the most important findings. In this case, the KMO value is .775 and Bartlett´s test is significant (P=. 000). Thus, the following factor analysis is appropriate. Furthermore, the analysis indicates that one factor can be extracted, accounting for 66,6% of the total variance.

Variable	**Factor loadings**
V17: The firm´s capability to implement efficient methods of production	***.856***
V18: The firm´s capability to develop a project from R&D to commercial production	***.852***
V19: The firm´s capability to implement quality control throughout the supply chain	***.725***
V20: The firm´s capability to generate feasible product development ideas	***.826***
KMO: .775, Bartlett´s test of Sphericity: P=. 000	
Total variance explained: 66,6%, Cronbach´s alpha: .831	

Table 10: *Factor analysis manufacturing capability*

The component matrix demonstrates that the items have factor loadings between .725 and .856, well above the suggested .4-minimum. The reliability analysis of the scale revealed a Cronbach´s alpha value of .831. By deleting the question about "Quality control through the supply chain", the Cronbach´s value would increase to .834. Nevertheless, the effect of deleting the question is marginal, and the original value is more than sufficient. In addition, it is better to have four questions to measure the concept of manufacturing capability, rather than three. Hence, all of the variables are retained further in this study.

5.2.2.5 Marketing capability

The following items measure marketing capability:

V21: The firm´s capability to establish good relationships with its customers

V22: The firm´s capability to maintain a positive reputation

V23: The firm´s capability to attain information of different market segments

V24: The firm´s capability to meet customers' needs after sales

The analysis of marketing capability resulted in a high KMO (.783), and a significant p-value of .000 (Appendix 8e). These findings indicate that factor analysis is appropriate, and that there is a strong relationship (correlation) among the variables. The results also indicates that one factor has an eigenvalue above 1 (2,9), explaining 74,6 % of the variance. Table 11 gives an overview of the most important results from the fifth factor analysis.

Variable	**Factor loadings**
V21: The firm´s capability to establish good relationships with its customers	***.877***
V22: The firm´s capability to maintain a positive reputation	***.918***
V23: The firm´s capability to attain information of different market segments	***.818***
V24: The firm´s capability to meet customers´ needs after sales	***.840***
KMO: .783, Bartlett´s test of Sphericity: P=. 000	
Total variance explained: 74,6%, Cronbach´s alpha: .885	

Table 11: *Factor analysis marketing capability*

In addition, all of the items have factor loadings well above .4. This indicates that the items truly measure a firm´s marketing capability. Further, the Cronbach´s alpha coefficient for the proposed construct is .885. From the column headed "Alpha if deleted" (Appendix 8e), we observe that no items can be deleted to increase the reliability of the scale.

5.2.2.6 Organizing capability

Four items measure the concept of organizing capability:

V25: The firm´s capability to coordinate R&D, marketing and production activities

V26: The firm´s capability to handle multiple time and resource demanding projects in parallel

V27: The firm´s capability to communicate with suppliers and customers

V28: The firm´s capability to measure the performance of its employees

The main results from the factor analysis of organizing capability are presented in table 12.

Variable	**Factor loadings**
V25: The firm´s capability to coordinate R&D, marketing and production activities	***.698***
V26: The firm´s capability to handle multiple time and resource demanding projects in parallel	***.805***
V27: The firm´s capability to communicate with suppliers and customers	***.763***
V28: The firm´s capability to measure the performance of its employees	***.841***
KMO: .722, Bartlett´s test of Sphericity: P=. 000	
Total variance explained: 60,6%, Cronbach´s alpha: .782	

Table 12: *Factor analysis organizing capability*

The results from the analysis indicate a sufficient KMO for conducting a factor analysis, with a value of .722. Bartlett´s test of sphericity is significant (P= .000), further supporting the suitability of the construct. Using Kaiser´s criterion, one component has an eigenvalue above 1, explaining 60,6% of the total variance. Furthermore, the component matrix in appendix 8f, show that the factor loadings are all above the suggested minimum. These findings indicate that the variables measure the underlying construct.

The reliability analysis of the scale resulted in a Conbach´s alpha value of .782. Even though values above .8 are preferable, values above .7 are considered acceptable (Hair et al. 2014). In this case there are no items that can be deleted to increase the Cronbach´s alpha value.

5.2.2.7 Strategic capability

The following items measure strategic capability:

V29: The firm´s capability to identify external opportunities and threats

V30: The firm´s capability to identify internal strengths and weaknesses

V31: The firm´s capability to implement plans using quantitative objectives

V32: The firm´s capability to convey its overall goals and core values to the employees.

The analysis resulted in a KMO value of .747, and a statistical significant Bartlett´s test with a p-value of .000 (Appendix 8g). In addition, one component meets Kaiser´s criterion with an eigenvalue above 1, explaining 69,4% of the total variance among the items.

Variable	**Factor loadings**
V29: The firm´s capability to identify external opportunities and threats	***.887***
V30: The firm´s capability to identify internal strengths and weaknesses	***.892***
V31: The firm´s capability to implement plans using quantitative objectives	***.801***
V32: The firm´s capability to convey its overall goals and core values to the employees	***.745***
KMO: .722, Bartlett´s test of Sphericity: P=. 000	
Total variance explained: 60,6%, Cronbach´s alpha: .782	

Table 13: *Factor analysis strategic capability*

As seen in table 13, all of the items have high factor loadings. This indicates a strong correlation between the original variables, and the proposed factor. In addition, the Cronbach´s alpha coefficient had a value of .848, indicating strong internal consistency. From the "Alpha if item deleted" table we observe that removing variable 32 would increase the Cronbach´s alpha value to .851. However, we choose to retain all of the variables to comprise the construct, as the original value is well above the suggested .7-minimum (Hair et al. 2014).

2.2.2.8 Cluster Interaction

The following items measure cluster interaction:

V38: Importance of local actors for the performance of the firm

V39: Overall, the most important actors for the company

V40: The importance of local collaboration for the technological innovative capability of the firms located in the cluster.

The sample adequacy (KMO) for the analysis of cluster interaction was .628, which is slightly above the recommended minimum (Pallant, 2010). In addition, the Bartlett´s test of sphericity was significant with a p-value of .000. This indicates significant correlation between the variables for a factor analysis to be appropriate. Looking at the "Total variance explained" table (Appendix 8h), we observe that one factor accounts for 67,5% of the variance.

Variable	**Factor loadings**
V38: Importance of local actors for the performance of the firm	***.887***
V39: Overall, the most important actors for the company	***-.701***
V40: The importance of local collaboration for the technological innovative capability of firms located in the cluster	***.865***
KMO: .628, Bartlett´s test of Sphericity: P=. 000	
Total variance explained: 67,6%, Cronbach´s alpha: .821	

Table 14: *Factor analysis cluster interaction*

Furthermore, all of the variables have factor loadings above the suggested .4 cut-off point. However, variable 39 displayed a negative loading to the underlying construct. Further investigation of the communalities (Appendix 8h), revealed that variable 39 had a communality of .491. This indicates that the variable share 49% of its variance with the other variables in the study. Hair et al. (2014) argue that items (variables) should have a communality of at least .6, to accurately measure the underlying construct. Hence, variable 39 was removed from the analysis as it provided negative loading and a low communality. After the construct was reduced to a two-item scale, it displayed Cronbach´s alpha value of .821.

2.2.2.9 Firm performance

The following items measures firm performance:

V6: In percentage, the change in turnover from the preceding year.

V34: Percentage of the company´s products/service the last three years, representing new launches or significant technological innovations

V35: The company´s position compared to its rivals in regards to product/service quality

V36: The company´s position compared to its rivals in regards to cost levels

V37: The company´s position compared to its rivals in regards to development time from R&D to commercial production

The analysis of firm performance resulted in a sufficient KMO (.761) and a significant Bartlett´s test (P=.000). Two components meets Kaiser´s criterion with an eigenvalue above 1. However, a single factor solution explains 50,1 % of the total variance, and is retained for further investigation due to theoretical considerations. Table 15 provides an overview of the most important findings of the analysis, while the most relevant output can be found in appendix 8i.

Variable	**Factor loadings**
V6: In percentage, the change in turnover from the preceding year	***.423***
V34: Percentage of the company´s product/services the last three years, representing new launches or significant technological innovations	***.671***
V35: The company´s position compared to its rivals in regards to product/service quality	***.745***
V36: The company´s position compared to its rivals in regards to cost levels	***.789***
V37: The company´s position compared to its rivals in regards to development time from R&D to commercial production	***.829***
KMO: .761, Bartlett´s test of Sphericity: P=. 000	
Total variance explained: 50,1%, Cronbach´s alpha: .788	

Table 15: *Factor analysis firm performance*

After inspecting the factor loadings and communalities, we observed that variable 6 and 34 had relatively low correlations with the underlying construct. After running the reliability analysis with and without variable 6 and 34, we choose to exclude them due to the large increase in the Cronbach´s alpha value.

5.2.3 New variables

Based on the central dimensions of the factor analyzed above, 9 summated scales were created (Cf. Table 16). The scales were constructed by adding the scores on each related item, and dividing by the number of questions.

Construct	Items	Remark
Learning Capability	**7,8,9**	**Accepted**
R&D Capability	**10,11,12,13**	**Accepted**
Resource Capability	**14,15,16**	**Accepted**
Manufacturing Capability	**17,18,19,20**	**Accepted**
Marketing Capability	**21,22,23,24**	**Accepted**
Organizing Capability	**25,26,27,28**	**Accepted**
Strategic Capability	**29,30,31,32**	**Accepted**
Cluster Interaction	**38,40**	**Accepted**
Firm Performance	**35,36,37**	**Accepted**

Table 16: *Summated scales*

Even though the new variables differ to some degree from previous studies on TICs (e.g. Guan and Ma 2003;Yam et al. 2004; Burgelman, 2006), the candidates claim to have captured the underlying tendencies of constructs relevant for this thesis.

Table 17 presents Persons correlation coefficient of the new summated scales. This gives an idea of the strength and direction of the linear relationship between the variables. All of the independent variables displayed positive significant correlation with the dependent variable (Firm Performance). Out of these, marketing capability displayed the strongest relationship (r= .745). In addition, we observe that cluster interaction is positively and significantly correlated with the dependent variable. On the other hand, number of employees (firm size) shows a negative and non-significant correlation with firm performance. This indicates that larger firms do not necessarily outperform smaller ones. Finally, no correlations are higher than recommended values (Pallant, 2010), indicating no problem with multicollinearity.

	1	2	3	4	5	6	7	8	9	10
1. Learning Capability		.789*	.669*	.793*	.624*	.686*	.635*	.416*	-.005	.664*
2. R&D Capability	.789*		.802*	.857*	.589*	.715*	.687*	.321*	-.017	.646*
3. Resource Capability	.669*	.802*		.765*	.550*	.703*	.688*	.392*	.104	.545*
4. Manufacturing Capability	.793*	.857*	.765*		.639*	.782*	.729*	.362*	-.080	.731*
5. Marketing Capability	.624*	.589*	.550*	.629*		.638*	.602*	.506*	.021	.745*
6. Organizing Capability	.686*	.715*	.703*	.782*	.638*		.760*	.411*	.077	.717*
7. Strategic Capability	.635*	.687*	.688*	.729*	.602*	.760*		.499*	.035	.637*
8. Cluster Interaction	.416*	.321*	.392*	.362*	.506*	.411*	.499*		.077	.515*
9. Number of Employees	-.005	-.017	.104	-.080	.021	.077	.035	.077		-.098
10. Firm Performance	.664*	.646*	.545*	.731*	.745*	.717*	.627*	.515*	-.098	

* = P < .05

Table 17: *Correlation matrix*

5.2.4 Model testing

In order to test the direct and moderation hypothesis, two regression analyses are conducted. The first model represents regression of all the independent variables on the dependent variable, in order to test H1, H2, H3, H4, H5, H6 and H7. In the second model, the moderating variables are included. This model allows us to test the remaining hypothesis ($H8_{A-G}$ and $H9_{A-G}$). Hence, the following regression models are applied in this study:

Model I:

$$FP=\beta 0 +\beta 1X1 +\beta 2X2 + \beta 3X3 +\beta 4X4+\beta 5X5 + \beta 6X6 +\beta 7X7$$

Model II:

$$FP=\beta 0 +\beta 1X1 +\beta 2X2 + \beta 3X3 +\beta 4X4+\beta 5X5 + \beta 6X6 +\beta 7X7+ \beta 8X8+ \beta 9X9$$

Where:

FP= Firm Performance
X1= Learning Capability
X2= R&D Capability
X3= Resource Capability
X4= Manufacturing Capability
X5= Marketing Capability
X6= Organizing Capability
X7= Strategic Capability
X8= Cluster Interaction_ TICs Moderation
X9= Firm Size_TICs Moderation
β0= Constant

5.2.4.1 TICs on performance

The first regression analysis tested the relationship between the seven TICs and firm performance. Table 18 provides an overview of the most important results from the analysis:

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-,497	,453		-1,096	,277		
	Learning_Capability	,073	,141	,063	,518	,606	,305	3,274
	RD_Capability	,032	,170	,029	,186	,853	,192	5,211
	Resourcea_Capability	-,196	,126	-,190	-1,562	,123	,307	3,253
	Manufacturing_Capability	,380	,178	,337	2,139	,036	,184	5,448
	Marketing_Capability	,490	,112	,415	4,385	,000	,510	1,961
	Organizing_Capability	,311	,156	,250	1,995	,050	,291	3,437
	Strategicplaning_Capability	,014	,131	,012	,109	,914	,351	2,849
	Adjusted R-Square: .667							
	F: 21.906 (P=.000)							

Table 18: *Regression model I*

The VIF and the Tolerance values in the "collinearity diagnostics" table are well within critical values, indicating no problem with multicollinearity. Furthermore, inspection of the Normal P-P plot and Scatterplot of the standardized residuals (Appendix 9a), showed no major deviation of normality. The adjusted R^2 for the presented model is .667, indicating that the independent variables explains 66% of the variance in the dependent variable (firm performance). The model also reaches statistical significance with an F-value of 21.906 (P=. 000), indicating a good model fit.

The results show that marketing capability makes the strongest unique contribution to explain firm performance (Beta = .415, P < .05). This entails that a 1-unit increase in marketing capability leads to a .415 unit increase in firm performance. The other statistical contributors are manufacturing capability (Beta = .337, P < .05) and organizing capability (Beta = .250, P <. 05). On the other hand, learning capability, R&D capability, resource capability and strategic capability, had no statistical significant effect on firm performance at a p < .005 level.

5.2.4.2 Moderating effects

The second model aims to test if there are any moderating effects of cluster interaction and firm size on the linkage between the various TICs and firm performance. This analysis also includes firm performance as the dependent variable. Interaction terms (moderating variables) were created by multiplying the centered variables of the relevant scales. In addition, the original independent variables are included in the second regression model. Hypothesis $8_{A\text{-}G}$ suggests that organizational size will have a magnifying effect on the different TICs constructs. On the other hand, hypothesis $9_{A\text{-}G}$ proposes that such magnifying effects occur when there are high levels of interaction between actors in a cluster (cluster interaction). Table 19 presents the most important findings from the second regression analysis.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
2	(Constant)	4,788	,093		51,398	,000		
	(Cluster) x Resource Capability	,403	,169	,526	2,386	,020	,111	9,004
	(Cluster) x Manufacturing Capability	,697	,214	,902	3,254	,002	,170	9,206
	(Cluster) x Marketing Capability	,279	,129	,380	2,161	,034	,175	5,710
	Learing_Capability	,178	,180	,153	,985	,328	,176	5,679
	RD_Capability	,084	,166	,077	,506	,614	,187	5,357
	Resourcea_Capability	-,197	,125	-,191	-1,578	,199	,291	3,433
	Manufacturing_Capability	,357	,178	,317	2,010	,049	,172	5,819
	Marketing_Capability	,420	,113	,355	3,723	,000	,469	2,134
	Organizing Capabilty	,348	,15	,28	2,28	,026	,28	3,51
	Strateigcplanning_Capability	,043	,15	,03	,282	,78	,24	4,40
	Adjusted R-Square: .688							
	F: 18,912 (P = .000)							

Table 19: *Regression model II*

Inspection of the VIF and the Tolerance revealed no violation of the multicollinearity assumption. However, the VIF values for the interaction term "*cluster x resource capability"* and "*cluster x manufacturing capability"* is rather high. This indicates that the variability of the mentioned variables is influenced by the other independent variables in the model (Pallant, 2010). Therefore the interpretations must be considered tentative rather than definitive. The Normal P-P plot and the Scatterplot (Appendix 9b) indicate a normal distribution of the standardized residuals. A positive moderating effect of cluster interaction is seen as the adjusted R^2 increases from .667 (model 1) to .688 (model 2). This entails that the new model, with the moderating variables, explains 68% of the variance in firm performance. The model also reaches statistical significance with an F value of 14,996 (P = .000), indicating a good overall model fit. Cluster interaction had the strongest moderating effect on manufacturing capability with a Beta of .902 (P < .05). Furthermore, cluster interaction had a statistical significant moderating effect on resource capability (Beta = .526, P < .05) and marketing capability (Beta = .380, P < .05). Firm size, on the other hand, displayed no moderating effect on the linkage between the various TICs and firm performance. To better illustrate the moderating effect identified by this study, the sample was divided into three subgroups based on their level of cluster interaction: *low cluster interaction, medium cluster interaction* and *high cluster interaction*. Figure 12 displays the relationship between manufacturing capability and firm performance for the different subgroups.

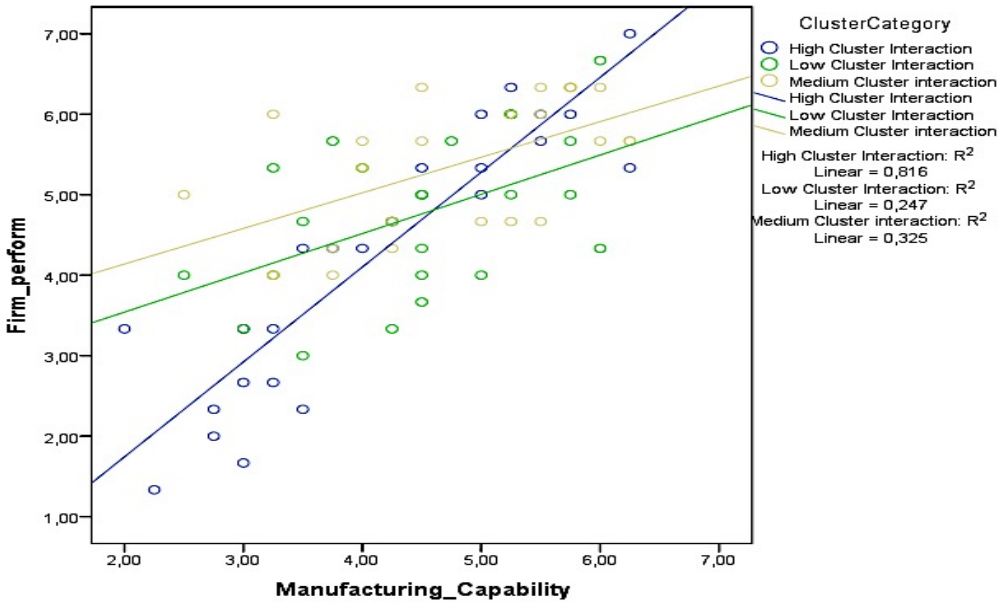

Figure 12: *Moderating effect of cluster interaction on manufacturing capability*

The scatterplot shows that the relationship between the two variables (manufacturing capability and firm performance) strengthens proportionally with level of cluster interaction. Among the *high cluster interaction* group, the correlation between the two variables is .665[26]. For the *medium* and *low cluster interaction* groups, the correlation between the variables has decreased to .10 and .06, respectively. This displays the notion that higher levels of cluster interaction positively moderate the relationship between the mentioned TICs and firm performance.

5.2.5 Summary of quantitative analysis

The results from part 5.2.4 are presented to best answer the proposed research question, and the related hypothesis. In total, the analyses identify marketing capability, manufacturing capability and organizing capability as significant contributors to firm performance of maritime equipment suppliers in MR. Furthermore, some moderating effect of cluster interaction was identified, whereas firm size displayed no such characteristics. Table 20 presents a summary of the hypothesis testing from the two regression models.

H1: Learning Capability positively influences firm performance	***Discarded***
H2: R&D Capability positively influences firm performance	***Discarded***
H3: Resource Capability positively influence firm performance	***Discarded***
H4: Manufacturing Capability positively influence firm performance	***Supported****
H5: Marketing Capability positively influence firm performance	***Supported****
H6: Strategic Capability positively influence firm performance	***Discarded***
H7: Organizing Capability positively influence firm performance	***Supported****
H8 A-G: Moderating Effect of Firm Size on TICs- Firm Performance	***Discarded***
H9 A-G: Moderating Effect of Cluster Interaction on TICs- Firm Performance	***Supported: C, D, E**** ***Discarded: A, B, F, G***

* P < .05 **Table 20:** *Summary of hypothesis testing*

[26] Correlation is calculated as follow: $R\text{-}Square^2$

6.0 Discussion

The following chapter will discuss the results obtained from the qualitative and quantitative analysis in part 5.0. The purpose is to investigate whether TICs affects the performance of maritime equipment suppliers in MR (RQ1). In addition, this part will deliberate the moderating effect of firm size (RQ2) and cluster interaction (RQ3).

6.1 TIC´s effect on firm performance (RQ1)

The various TICs were developed and tested with a sample drawn from 74 equipment suppliers in MR. Uniquely, the methodological approach in this study allowed us to asses the predictive validity of the scales through preliminary in-depth interviews. The results show that the proposed constructs provide researchers with a robust means for assessing the 9 dimensions. This is demonstrated through the factorial invariance, reliability and validity of the scales in part 5.2.2. Moreover, seven hypotheses were formulated to answer the research question "Does TICs affect the performance of maritime equipment suppliers in MR". Empirical results show that marketing capability, manufacturing capability and organizing capability had a statistical significant affect on the performance of the surveyed firms. Therefore, H4, H5, H7 were supported in this study. This indicates that improvements in these areas were helpful to business competitiveness among the maritime equipment suppliers in the cluster.

Contradictory to expectations, learning capability, R&D capability, resource capability and strategic capability were identified as insignificant predictors of firm performance. These results conflicts the findings of several previous studies on TICs, such as Guan and Ma (2003), who identified manufacturing capability as the only insignificant construct among industrial firms in China. Their study also found that resource capability had the highest correlation with firm performance. Resource capability had no predictive capability in our study, and displayed the lowest correlation on performance of all the TICs (Cf. table 16). Similarly, Tseng et al. (2012) analyzed the effect of TICs on competitive performance, whereas they stress the importance of learning capability as the main driver of performance.

Nevertheless, our findings are partially in line with a few other studies questioning learning, organizing and resource capabilities as drivers of competitive advantage (Yam et al. 2004; Adler and Shenbar, 1990; Azubuike, 2013).

The non-significant competitive affect of R&D capability might be partially contributed to the " Norwegian Paradox" phenomena. The rationale here is that Norway's industrial economy, categorized by below-average level of innovation intensity, does not display a strong relationship between R&D and performance. According to Castellacci (2008), one of the reasons for this is that Norwegian firms focus on incremental process innovation, rather than radical product innovation. The subjects in the qualitative study share this view. Sindre Walderhaug explains how Seaonics is more dependent on an informal innovative organizational environment, rather than capital-intensive basic research. Correspondingly, Svein Kleven at Rolls Royce argues that there is a shorter path from idea generation to prototype development in Norway, compared to many other countries. This, in turn, reduces the need for traditional R&D activities.

6.2 Moderating effect of firm size (RQ2)

The maritime cluster in MR is categorized by many small and medium-sized enterprises (SMEs), in addition to a few multinational enterprises (MNEs). These characteristics of the cluster are captured by the presented study. Our results show that the number of employees of the 74 equipment suppliers ranges from 1 to 2000, with the average firm having a total workforce of 68 employees. Hypothesis $8_{A\text{-}G}$ were formulated to investigate if firm size had a positive moderating effect on the linkage between the TICs and organizational performance. Through statistical analysis, firm size revealed no significant magnifying effect on the relationship between the various constructs and performance. Thus, this study displays little evidence in support of the Schumpeterian hypothesis, stating that larger firms enjoy economic benefits of innovation (Schumpeter, 1942). One reason for this is arguably the rapid international expansion of SMEs in the MR cluster, in which many small firms enjoys large market shares internationally (GCE Maritime, 2014). In addition, smaller firm might be better positioned to practice agility when adapting their technology base to match market needs. These arguments reflect a stream of recent studies arguing the present of an

inverted U-shaped relationship between firm size and innovation performance (e.g. Becker et al. 2010; Niman 2004; Tseng et al. 2012).

The three firms included in the qualitative analysis also varied in organizational size. Rolls Royce represents the largest supplier with over 400 employees. Sperre and Seaonics have 90 and 41 employees, respectively. In 2014, Sperre had the largest profit margin of the companies (9,3%)[27]. In terms of innovation performance, all three firms reveal that they have launched new products/ services the last five years. For Rolls Royce, the biggest development has been in the service segment where the company has improved their monitoring systems on board vessels. On the other hand, Seaonics have advanced their seismic winch packages and acquired smaller software providers to improve their control systems. For Sperre, the most significant product innovation occurred in 2010 with the introduction of the X-range compressor, which requires fewer parts and less maintenance and service. Collectively, these finding emphasize that TICs play an important role and should be cultivated among small and large companies alike.

6.3 Moderating effect of cluster interaction (RQ3)

We argued earlier in the study that geographic proximity among industry actors facilitates knowledge spillover, communication and competitive pressure. In turn, this is believed to have a magnifying effect on cluster participants' competitive performance. Surprisingly, the descriptive analysis revealed that a large proportion of the surveyed suppliers viewed international actors as more important for their company than local ones. This indicates that geographic proximity is neither necessary nor a sufficient condition for learning to take place. According to Bochma (2005), too much proximity might even be detrimental for innovation and learning. The rationale here is that industry "lock-in" is harmful when radical innovations requires outside knowledge, skills and institutional support. These findings challenge traditional cluster theory, stating that geographic proximity and knowledge spillover is a fundamental driver of innovation (Porter, 1998).

[27] 27 000 000 / 288 000 000 * 100% = 9,3%

Nevertheless, the model testing in part 5.2 supported the notion of a significant moderating effect of cluster interaction on the linkage between TICS and performance. This led to the acceptance of hypothesis $H9_C$, $H9_D$ and $H9_E$. These findings are coherent with prior research supporting the link between geographic proximity, innovation and firm performance (e.g. Porter, 1998; Morosini, 2002; Rogers, 2004; Dhewanto et al. 2012). Specifically, manufacturing capability, marketing capability and strategic capability displayed a cumulative impact on firm performance, as the level of cluster interaction increased. Thus, the maritime cluster in MR seems to enjoy some enhanced effects of innovation due to a high level of interaction between suppliers, customers and research institutions. A key reason for this might be the interdependence between local actors, as they are engaged in the production of highly diversified products. Accordingly, maritime suppliers are involved with several steps through the supply chain, and rely on the accretion of knowledge between industry partners. Such corporation goes beyond the scope of any of the proposed innovation capabilities. It is based on harmonization of existing capabilities within the firm, with complementary abilities outside the firm (Guan and Ma, 2003). This places the MR cluster in a unique position to utilize its knowledge sharing to gain competitive advantage. As product developer, Nicolai Bjørge at Sperre stated:

” *In MR everything is at one place. The proximity to suppliers, competitors, collaborators, and the costal line are all beneficial factors for the maritime cluster”.*

Hence, this study fills the research gap in the TICs literature by identifying that cluster interaction can have a moderating affect on performance. Explicitly, we argue that higher level of interaction between local actors creates a “local buzz”, influencing innovation in the areas of manufacturing, marketing and organizing.

7.0 Implications

7.1 Managerial implication

The context of this thesis is highly relevant due to the present situation in the maritime industry. The success of the cluster in MR has traditionally been based on the ability to respond rapidly to new market opportunities. In addition, the close dialogue between customers, suppliers and research institution has been a vital source of competitive advantage. In facing new requirements, it is vital that managers have a balanced approach to technological innovation. Our study showed that the utilization of manufacturing capability, marketing capability and organizing capability are important for firm performance. These results have several managerial implications. First of all, product and service development should be fortified in a basic understanding of current and future demand within the industry. The results show that supplier's ability to maintain a positive reputation and meet customers´ needs after sales are positively related to marketing capability. Therefore, maritime suppliers in MR should ensure proficiency by learning from previous mistakes in contractual relationships. This can be done by evaluating partnerships and identifying best practices.

A second implication is the requisite for innovative firms to increase their manufacturing capabilities, by matching R&D-output with market needs. This is of particular importance in the maritime industry, characterized with high levels of product differentiation. Product quality, production costs and delivery conditions are considered important input-factors for upstream buyers in the industry, such as shipping companies and shipyards. Consequently, it is important for suppliers in MR to initiate efficient methods of production, such as lean manufacturing and just-in-time (JIT) delivery, in order to stay competitive.

Third, this study has shown that companies can enhance their performance by utilizing their organizing capability. Hence, it is vital for companies to exploit the full potential of their staff and the organizational structure. The emphasis should be to coordinate activities across divisions towards shared objectives. This can be done through in-house training, performance monitoring systems and knowledge-enhancing activities. Such organizational practices are likely to influence the speed of the innovation process, and amplify the firm´s competitive advantage.

Finally, actors in the MR cluster should actively contribute to knowledge sharing through industry collaboration. Our results show that interaction between cluster participants has a positive influence on the commercial effect of innovation. Thus, suppliers in MR should engage in seminars and research projects, such as the European clusters for offshore wind servicing (ECOWindS) project[28]. This facilitates knowledge transfer between companies and ensures a sense of cluster belonging. Similarly, active collaboration between companies and universities are important to develop common understanding of industry needs. Accordingly, results from this study indicate that collaboration in the areas of marketing and manufacturing might be most prosperous. On the other hand, there is an insignificant relationship between R&D-capabilities and firm performance. These results are in line with the previous discussion of the "Norwegian paradox", indicating that innovation in the cluster is far more complex than traditional R&D activities.

7.2 Policy Implications

The government´s commitment to the Norwegian maritime industry is critical for its future competitiveness. As previously mentioned, the industry accounted for 11% of GDP, and employed around 112 000 people in 2013 (Norwegian Ministry of trade, 2014). The industry´s high employment rate, value creation and spillover to other industries make it an essential contributor for the entire Norwegian economy. Hence, it is important that the government presents stable framework conditions to stimulate growth and innovation. With this, it is imperative to employ forward-looking policies with emphasis on innovation of environmentally friendly solutions. A proactive approach towards a "green shift" will arguably strengthen the value creation of the industry, and provide a long-term competitive edge.

This work has pointed out that the level of interaction between industry actors has an effect on organizational performance. This underlines the need for knowledge-sharing mechanisms within the industry. Consequentially, policy should be aimed at facilitation cooperation between industry actors. The introduction of regional and

[28]The project builds on existing networks within offshore wind energy to establish cluster cooperation in offshore wind servicing (OWS). For more information, see: http://www.ecowinds.eu

national industry research programs are examples of such initiatives. Already established research program includes the innovation program for maritime activities and offshore operations (MAROFF). The objective of the program is to realize the government´s maritime strategy for promoting innovation and environmentally sustainable value creation throughout the industry[29]. By subsidizing and promoting similar projects, the government can aid the adaptation of knowledge throughout the industry. Arguably, future governmental initiatives should be more specialized by focusing on different industry segments (e.g. electronic equipment suppliers), or geographical locations (e.g. the MR region). This will increase regional specifications, and ensure the continuing development of a complementary industry.

7.3 Limitations and future research

The aim of this thesis was to examine whether TIC`s had an effect on firm performance, and to what extent firm size and cluster interaction moderates this linkage. Even though the presented study contributes to both theory and practice, the reader should be aware of certain limitations. First of all, our study is based on a questionnaire consisting of self-reporting items, which may weaken the reliability of the results. A well-performed survey assumes that all participants have the same understanding of the terms used in the survey. However, it is impossible to ensure that all respondents who completed the questionnaire interpreted the questions the same way.

Furthermore, the qualitative interviews were conducted face-to-face in the firm`s head quarters. We did not conduct further interviews with other employees in the same organization, which makes the collected information difficult to verify. This may lead to the danger of response bias, which refers to individual's tendency to respond a certain way, regardless of the actual evidence they are assessing. The interviewee may in this respect be "colored" by their position and only respond positively to questions, because they want to improve the perception of their organization. Even though the candidates strived to avoid leading questions, there is a certain probability that the interviewees were influenced by the interviewers.

[29] For more information, see: www.forskningsradet.no/en/Funding/MAROFF/1198060682070

Another limitation is related to the sample size of the quantitative analysis. As expected, gathering data from equipment supplier proved to be hard, and the candidates ended up with a total of 75 responses. Even though this represents a rather small sample size, the results provide us with valuable information to confirm/reject our hypothesis. Nevertheless, generalization of the findings should be taken with caution.

Future studies can examine the suitability of the proposed framework in other industries. Another interesting area of research would be to increase the scope of the study, by including firms from different sectors of an economy. This could increase the number of respondents, and the researcher would be able to compare the importance of technological innovation among different subgroups. In addition, the constructs applied in this study may be subject to other relationships than suggested. This underscores the importance of additional testing of items constructing the different capabilities. This study examined the research questions through interviews and surveys, only providing cross-sectional data. Therefore, longitudinal studies could be applied to investigate the development of TICs over time. Finally, empirical studies should also be conducted outside industry clusters, to examine whether different linkages between TICs and performance occur.

8.0 Conclusion

The maritime cluster in Møre and Romsdal is facing great challenges due to recent development in the offshore oil and gas segment. Decreasing oil prices have led to rapid readjustments and cost reductions throughout the industry. At the same time these changes provide new opportunities for more environmentally friendly and smarter solutions. In the future, many of these solutions will not just be used in the petroleum industry, but in other neighboring industries as well. Hence, the cluster´s technological innovation is critical to meet these challenges. This study investigated how TICs drives the performance of maritime equipment suppliers in Møre and Romsdal, and to what extent this relationship is moderated by cluster interaction and firm size.

The results show that manufacturing capability, marketing capability and organizing capability significantly influences performance among the suppliers. Out of these, marketing capability proved to be the most valuable predictor. Furthermore, the results suggest that the level of cluster interaction have some moderating effect on the relationship between TICs and firm performance. Thus, the collective knowledge carried by firms and research institutions is important for the region. Referring to the differences in organizational size, no great alterations were found to distinguish the relationship between innovation and performance. Consequently, this study does not support the notion of a moderating effect of firm size. This might be seen as a result of the size distribution of the cluster, where firms are typically small and tend to innovate in close cooperation with their customers.

These results provide important implications for both the Norwegian government and firms within the cluster. First and foremost, managers should pay more attention to TICs, as they represent proven drivers of performance. Of particular importance is innovation in the areas of manufacturing, organizing and marketing. Therefore, it is imperative for maritime suppliers to undertake actions to continuously improve the efficiency of production, in order to stay competitive. This can be done by removing wasteful steps along the supply chain that don´t add value to the end product or service. Furthermore, organizing capability can be advanced by utilizing knowledge-enhancing activities, such as in-house training and education of employees. This study

also underlines the importance of improving contractual relationships and match product development with customers' needs, as it enhances a firm´s marketing capability. Collectively, these measures help the region being in the forefront of developing emerging offshore industries such as marine biotechnology, renewable energy and offshore aquaculture. As a consequence, future policy should aim to stimulate innovation and cooperation within the industry. Only this way can the maritime cluster in Møre and Romsdal continue to be a trendsetter of sustainable exploitation of the sea.

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Appendices

Appendix 1: Interview guide

INTERVJUGUIDE

Navn:
Firma:
Stilling:

Lærings Kompetanse
1. Hvordan vurderer ledelsen teknologiske trender relevant for selskapet? 2. Samarbeider dere med andre aktører for å identifisere nye muligheter i forskjellige markeder? I så fall, hvilke aktører? 3. Hvordan vil du vurdere selskapets evne til å tilpasse teknologi til markedets behov?
FoU Kompetanse
1. I hvor stor grad tar dere hensyn til kunders tilbakemelding i videreutvikling av produkter og/eller tjenester? 2. Hvilken policy har dere på bevilgning av midler til utvikling av nye produkter og/eller tjenester? 3. Anslagsvis, hvor stor andel av de ansatte jobber med utvikling av nye produkter og/eller tjenester?
Ressurs Kompetanse
1. Hvilke krav stiller dere til utdanningsnivå og arbeidserfaring for ansettelse i ulike avdelinger? 2. Tilbyr dere kurs og videreutdanning til deres ansatte?
Produksjons Kompetanse
1. Hvordan jobber dere med å effektivisere produksjonsmetoder? 2. Hvordan implementerer dere kvalitetskontroll i gjennom verdikjeden? 3. Hvordan vil du vurdere selskapets evne til å bringe en ide til kommersiell produksjon?

Markeds Kompetanse
1. Hvordan går dere frem for å opprettholde gode relasjoner til selskapets kunder? Har dere en systematisert fremgangsmåte til CRM? 2. Måler dere kundetilfredshet? I så fall, hvordan innhenter dere denne informasjonen? 3. Hvordan vil du karakterisere selskapets omdømme? Og hvordan er deres omdømme sammenlignet med deres nærmeste konkurrenter?
Organisatorisk Kompetanse
1. Kan du fortelle oss hvordan dere kommunisere med leverandører? 2. Har dere et system for å måle ansattes prestasjoner? 3. ”Benchmarker” dere selskapets prestasjoner opp mot konkurrenter eller andre aktører?
Strategisk Kompetanse
1. Hvordan går dere frem for å identifisere eksterne muligheter og trusler? 2. Bruker dere kvantitative målsetninger i utarbeidelsen av strategiske planer (f. eks. balansert målstyring) ? 3. Hvordan blir selskapets kjerneverdier formidlet til de ansatte?
Prestasjons indikatorer
1. Hvordan er selskapets produkt og/eller service kvalitet i forhold til deres nærmeste konkurrenter? 2. Har dere lansert noen varer og/eller tjenester de siste 5 årene som er nylanseringer eller betydelige teknologiske innovasjoner?

I følge OECD scorer Norge lavt på tradisjonelle mål på innovasjon (f. eks. bevilgning av midler til FoU) i forhold til andre EU- land. Samtidig scorer Norge høyt på produktivitet og vekst. Dette fenomenet blir kalt det ”Norske Paradokset”.

- Hva tror du er de viktigste årsakene til dette paradokset?

Avsluttende spørsmål

1. Er det noe du ønsker og legge til som ikke har blitt nevnt?

Appendix 2: Interview with Seaonics

Dato: 26.01.2016
Navn: Sindre Walderhaug
Firma: Seaonics
Stilling: Operation manager

1. **Hvordan går dere frem for å vurdere teknologiske trender relevant for selskapet?**

Vi er en bedrift eid av Vard, og de har sitt system på hvordan man analysere trender. Både styre og ledelsen bidrar til å vurdere de teknologiske trendene. Ledelsen prøver å forutse hva som skjer ved å vurdere hvordan våres kunder vil utruste sine fartøy etc. Gode relasjoner til kundene hjelper oss å vurdere relevante trender.

2. **Samarbeider dere med andre aktører for å identifisere nye muligheter i forskjellige markeder? I så fall, hvilke aktører?**

De største aktørene vi samarbeider med er forretningsmessige, både leverandører og kunder. Vi er også innen andre segment enn bare offshore. Vi er også innen fiskeri og forskningsskip. Det er de to segmentene som er i aktivitet i dag. I 2014 var 80 % oppimot offshore, I 2015 er 90 % oppimot fiskeri og forskningsskip. Markante skift. Vi er ei lita bedrift, så det vil være letter for oss å omstille oss enn hva det er for større aktører.

3. **Hvordan vil du vurdere selskapets evne til å tilpasse teknologi til markedets behov?**

Når vi er en såpass ny bedrift så er det viktig å tilpasse teknologi til hvordan markedets behov er akkurat nå. Siden vi er en liten bedrift har vi lette for å omstille oss etter hvordan behovene til kundene i markedet er.

4. **I hvor stor grad tar dere hensyn til kunders tilbakemelding i videreutvikling av produkter og/eller tjenester?**

Kunders tilbakemelding er vesentlig viktig. Det er viktig for oss å snakke med kundene vår for å finne gode løsninger. Vi er fortsatt en veldig ung bedrift, og har ikke klart å tømme idetankene våres helt enda. Men vi er holder nær kundekontakt og bruker kunder tilbakemeldinger når vi utvikler produkt. Vi er også lydhøre til kunders ønsker og behov og prøver å bruke dette I utvikling av nye produkt.

5. **Hvilken policy har dere på bevilgning av midler til utvikling av nye produkter og/eller tjenester?**

Vi er ei såpass ny bedrift at alt vi driver med er nyutvikling. Vi er så vidt begynt å få en samling produkt som vi kan si ikke er nyutviklinger. Frem til nå er alt ny utvikling.

6. **Anslagsvis, hvor stor andel av de ansatte jobber med utvikling av nye produkter og/eller tjenester?**

Vi er som sagt en såpass ny bedrift at nesten alle de ansatte i bedriften jobber med utvikling av nye produkt. Anslagsvis, vil jeg påstå at kanskje 78-80% av alle jobber med utvikling.

7. **Hvilke krav stiller dere til utdanningsnivå og arbeidserfaring for ansettelse i ulike avdelinger?**

Vi er en relativ ung bedrift som startet opp for kort tid siden. Og siden oppstart i 2011 har vi vokst ganske fort, både i antall ansatte og i antall produktutviklinger. I en vekstfase, handler det om å knytte til seg personer med relevant erfaringer som mangler i bedriften. Vi har ikke kommet dit hvor vi har en matrise som sir hvilke nivå vi må ansette ansatte fra, det handler mer om hvilke behov bedriften har. Så krav om utdanningsnivå og arbeidserfaring blir en individuell vurdering i større grad enn hva det ville vært i en relativt større bedrift.

8. **Tilbyr dere kurs og videreutdanning til deres ansatte?**

Ja, det gjør vi. Vi har høy kursaktivitet. De fleste kursene vi tilbyr er kurs for opplæring av dataprogram som er nødvendige for å utføre jobbene vi utfører.

Vi startet på bar bakke for 5 år siden så det er mange rutiner og system som må på plass. Noen program har vært gitt og andre ikke. Det har vært en del kursing på datasystem, men også en del kursing om tverrfaglige system som hydraulikk kompetanse, elektro etc.

9. Hvordan jobber dere med å effektivisere produksjonsmetoder?

Vi outsourcer all produksjon til øst Europa. Ved å outsource all produksjon til Asia ville man kunne fått produksjonen billigere enn å outsource til Europa, men det krever en del ressurser. Vi har valgt å gå til trygge leverandører som vi hadde gode relasjoner med fra før. Som ny aktør kan man ikke vær for vågal i produksjonssettingen. Som ny aktør må man ha en viss kvalitet for å vise sin posisjon i markedet. Ved å gå til aktører som vi har trygge relasjoner med og et godt samarbeid, kan vi sammen med de prøve å effektivisere metodene.
Litt av utfordringen vår er at vi hele tiden har nye produkt. Vi har enda ikke en historie å dra med oss i produksjonen som vi kan sammenligne med. Derfor er det viktig for oss å ha en aktør som kan ta nye produkt uten å ha en komplett oversikt over hvordan ting vil bli eller vær før vi starter. Derfor er det viktig med aktører som en har gode relasjoner med og at vi sammen kan se for oss en fremtid med samarbeid, og på denne måten binde opp litt kostnader.

10. Hvordan implementerer dere kvalitetskontroll i gjennom verdikjeden?

Vi har en del kvalitetskontroller. Det er viktig med oppfølging. Vi har kvalitetskontroll på underleverandører, vår egen produksjonskjede, og vi er med i testingen av produktet.

11. Hvordan vil du vurdere selskapets evne til å bringe en ide til kommersiell produksjon?

Jeg vil påstå at vi har en relativt god evne. Vi har ikke levd lenge nok til å få et stort volum enda, men vi er veldig fornøyd med prosessen med å lage en prototype å få de til kommersielle produksjon.

12. **Hvordan går dere frem for å opprettholde gode relasjoner til selskapets kunder? Har dere en systematisert fremgangsmåte til CRM?**

Vi har ca. 10 ansatte som jobber med service og etter- marked. Fra februar vil bedriften vokse med ca. 50 ansatte, disse har blitt solgt til oss fra Vard electro. Her vil det komme en del service ingeniører. Mange av disse bruker vi også i dag.

13. **Måler dere kundetilfredshet? I så fall, hvordan innhenter dere denne informasjonen?**

Vi har kundeundersøkelser i form av spørreundersøkelser. Vi har flere kundenivå, vi har verft, båteier og operatører, og alle skal være fornøyd. De ulike kundene har ulike interesser. Verft er interessert i pris og installasjons kostnader, skipseier er opptatt av levetid og verdi, operatør er interessert i funksjonalitet og hvor trygt det er å bruke. Så vi har tre vurderingsståsted når vi skal måle kundetilfredsheten.

14. **Hvordan vil du karakterisere selskapets omdømme? Og hvordan er deres omdømme sammenlignet med deres nærmeste konkurrenter?**

Vi er som sagt en ny gutt I klassen. Så vi jobber fortsatt med å spre merkenavnet vårt. Men vi får gode tilbakemeldinger fra kunder, både når det gjelder kvalitet og funksjonalitet. Vi er optimistiske for fremtiden.

15. **Kan du fortelle oss hvordan dere kommunisere med leverandører?**

Vi har ansatte som har ansvar for dette området. Gode relasjoner med leverandører er veldig viktig for oss siden vi er en veldig ny bedrift.

16. **Har dere et system for å måle ansattes prestasjoner?**

Vi har begynt med KPI (Key Performance Indicator). Litt av problemet er å finne beskrivelser og målinger av de. KPI kan fort bli målt feil om ikke alt er på plass. Så de er fortsatt under testing.

17. **”Benchmarker” dere selskapets prestasjoner opp mot konkurrenter eller andre aktører?**

Vi benchmarker prestasjonsindikatorer opp mot relevante aktører i markedet.

18. **Hvordan går dere frem for å identifisere eksterne muligheter og trusler?**

Vi har ansatte som arbeider med analysere hvordan markedet utvikler seg. De har ansvar for å vær oppdatert på hav konkurrentene driver på med, trender på teknologi siden og endringer i markedet.

19. **Bruker dere kvantitative målsetninger i utarbeidelsen av strategiske planer (f. eks. balansert målstyring) ?**

Ja, men utfordringene i disse tider er at målsetningene har kort levetid. Vi hadde en dobling av omsetning de 4 første årene, men I 2015 var det en dobling helt til krisen kom. Så alt blir nå justert etter forholdene. 2015 var et år med mye justering og omstillinger.

20. **Hvordan blir selskapets kjerneverdier kommunisert til de ansatte?**

Vi har kjerneverdier som er oppsummert til REDD. Disse går vi igjennom hvert år på medarbeidersamtalene. I tillegg er de tilgjengelig i brosjyrer og ved selskaps-presentasjoner

21. **Hvordan er selskapets produkt og/eller service kvalitet i forhold til deres nærmeste konkurrenter?**

Vesentlig bedre er vår påstand. Vi har forskjellige konkurrenter, så det kommer an på hvilke segment vi snakker om. Innen Offshore er de største konkurrentene Rolls Royce, Kongsberg etc. Innen små kraner er det TTS, dreggen etc. Innen fiskeri er det Rolls Royce, Rap etc. Det er alltid kjekt å slå en bedrift med flere ressurser enn oss selv.

22. **Har dere lansert noen varer og/eller tjenester de siste 5 årene som er nylanseringer eller betydelige teknologiske innovasjoner?**

Ja det har vi. Vi er en 5 år gammel bedrift, så alt vi har laget er nylanseringer. Men innen vi startet opp har vi kommer med produkter som er helt nytt i bransjen, lanseringer bransjen aldri har sett før. Spesielt viktig var introduksjonen av "SEONICS MOONPOOL" og "Launch and Recovery" systemene.

23. **I følge OECD scorer Norge lavt på tradisjonelle mål på innovasjon (f. eks. bevilgning av midler til FoU) i forhold til andre EU- land. Samtidig scorer Norge høyt på produktivitet og vekst. Dette fenomenet blir kalt det "Norske Paradokset".**

- **Hva tror du er de viktigste årsakene til dette paradokset?**

De viktigste faktorene tror jeg er de kulturelle faktorene og klyngen her på Sunnmøre. Det at vi har aktører i alle posisjoner og at vi kan snakke i lag uten problemer er viktige påstander. Den klyngen vi jobber i her er unikt. Vi trenger ikke mye grunnforskning for å ta en vekst i ideer. Her er en uformalitet med å ta frem ideer som en kommer på. Konkurranse med naboen, hjelper også at vi hele tiden er på leiting etter nye utviklinger, og at vi hele tiden vil holde tritt med naboen. Se for deg bare fra Sunnmøre er vi 3-4 bedriften som reiser til kina for å selge samme produktet. Konkurransen ligger her.

24 **Er det noe du ønsker og legge til som ikke har blitt nevnt?**

Nei.

Appendix 3: Interview with Rolls Royce Marine

Dato: 26.01.2016
Navn: Svein Kleven, Oda Ellingsen
Firma: Rolls Royce Marine
Stilling: Engineering and Technology Director, Nærings PhD.

1. **Hvordan går dere frem for å vurdere teknologiske trender relevant for selskapet?**

Vi deler inn i kortsiktige og langsiktige trender, og vi analyserer om driverne til teknologiske trender endrer seg. På makro-nivå har vi en serie av drivere som advanced manufacturing og big data, for å nevne noen av disse. Disse danner rammeverket for å forsikre om at vi ikke har en teknologistrategi som er feil i forhold til trender. Vi analyserer også våre og konkurrenters styrker og svakheter, gjerne i form av en SWOT-analyse. I tillegg har vi mye mer dybde i analyser i viktige strategiske satsingsområder hvor vi skriver større avhandlinger om hva vi tror er trendene på teknologisiden. Å studere intellectual property rights, altså hvem som tar ut patenter på hvilke områder, er også en god "benchmark" på hva som skjer i den teknologiske utviklingen.

2. **Samarbeider dere med andre aktører for å identifisere nye muligheter i forskjellige markeder? I så fall, hvilke aktører?**

Innenfor læring har vi samarbeid med diverse universitet, da vi er interessert i hva forskningsinstitusjoner mener er veien videre. Vi prøver også å bruke norsk forskningsråd, innovasjon Norge, maritimt forum og mørebenken. Det er viktig for Rolls Royce å være tilstede på relevante forskningsprosjekter. Ved dette, representerer selskapet innen for de teknologiområdene som vi ønsker å sette på kartet. Klyngesmarbeidet mellom rederi, verft og leverandør har tradisjonelt sett handlet om å hente inn nye ideer og teste disse. Mens på teknologisiden samarbeider vi mye med universitet og leverandører.

3. **Hvordan vil du vurdere selskapets evne til å tilpasse teknologi til markedets behov?**

Kortsiktig handler det om å ha en teknologi som passer i markedet. Men mye mer interessant er det å tilby en teknologi som ender markedet, altså tilby løsninger som kundene i markedet ikke vet eksisterer. Generelt jobber vi med en 5-10 årsplan på teknologi og 3-5 årsplan på produkt. Derfor jobber vi kontinuerlig med å verifisere teknologien og produksjonsmetoden. Teknologien til markedets behov fungerer derfor som en test på om vi treffer med produktanalysene og prognosene våre. Vår tilnærming til markedsbehov er nok ganske proaktive da vi bruker mye av vårt overskudd til teknologi og produktutvikling. Det er viktig å tenke langsiktig når nedgangstider, derfor investerer vi aktivt i FoU, noe som også skaper arbeidsplasser som kanskje ellers ville gått tapt.

4. **I hvor stor grad tar dere hensyn til kunders tilbakemelding i videreutvikling av produkter og/eller tjenester?**

Kundene er veldig viktig for å få testet ut diverse ideer. Det er også viktig for oss at vi ikke har dialog med kun en kunde i utviklingsstadiet, men at man også får en forståelse av den generelle oppfatningen blant kundene rundt den løsningen man ønsker å utvikle. Jo mer hensyn vi tar til kunders tilbakemelding i produktutvikling, jo bedre rykte vill vi få i markedet. I disse nedgangstider opplever vi at de tradisjonelle samarbeidspartnere innenfor leverandørindustrien ikke har like mye ressurser å bidra med som før. Dette har ført til at vi har større andel interne investeringer i utviklingsprosjekt, og henter mindre andel av investeringer eksternt.

5. **Hvilken policy har dere på bevilgning av midler til utvikling av nye produkter og/eller tjenester?**

Vi anvender aktivt en viss andel av våre midler til å reinvestere i produktutvikling. I tillegg fokuserer vi mye på hvor mye vi investerer relativt innenfor de forskjellige teknologi og produktområdene. Dette blir gjort med at vi har både en totalstrategi og produktstrategi, hvor det blir spesifisert hvordan vi prioriterer de forskjellige prosjektene.

6 **Anslagsvis, hvor stor andel av de ansatte jobber med utvikling av nye produkter og/eller tjenester?**

Dette varierer litt innenfor de forskjellige forretningsområdene, men totalt innen Rolls Royce Marine er det rundt 20 % av våre ansatte som jobber fulltid innen R&D eller R&T. I tillegg har vi en viss andel ansatte som jobber med det vi kaller for sustainable engineering, som jobber med oppgradering av eksisterende produkt og vedlikehold.

7. Hvilke krav stiller dere til utdanningsnivå og arbeidserfaring for ansettelse i ulike avdelinger?

Det er viktig at en formell kompetanse er på plass, i tillegg til at det er rett person til rett jobb. Men vi har ikke noe policy som spesifiserer kontret utdanningsnivået på de ansatte, for eksempel at du skal en master eller en PhD. Hvilken formell kompetanse man har er nok mest viktig de første 5-6 årene i arbeidslivet, mens derifra og ut er det i større grad viktig hvordan vedkommende lærer og tilegne seg ny kompetanse. Så når vi screener et arbeidsmarked prøver vi, som alle andre , å få tak i de som har høyest potensial. Vi har også en kompetansekartlegging innen for hvert fagområde, hvor vi deler inn på en strukturert måte, læringsveien for de ansatte. Her går man fra nyansatt til det vi kaller for en fellow, som er en global ekspert innen for et viss område.

8. Tilbyr dere kurs og videreutdanning til deres ansatte?

Vi prøver å stimulere til høy kurs aktivitet, men ser ofte at det som tilbys av andre ikke er optimalt for oss. Derfor har vi vårt eget " Rolls Royce Acadamy", med egne program for å spesialisere utdanningen til de ansatte innenfor de fagfelt vi ønsker.

9.Hvordan jobber dere med å effektivisere produksjonsmetoder?

Vi er opptatt av å ha en kontinuerlig vurdering av hva vi skal produsere og hvor dette skal produseres. Vi ser også på tvers av produktporteføljer for å forsikre oss om at vi har optimal belastning i de forskjellige fabrikkene. Når det gjelder selve produksjonsmetoden er vi veldig opptatt av det vi kaller for advanced manufacturing, og muligheter som finnes i robotteknologi og materialteknologi. Det som er utfordringen for et selskap som Rolls Royce er at vi har et behov for å ha en god del aktivitet i høykostnadsland, noe som betyr at vi må være mest effektive. Vi ønsker å ha

en viss næret til de produktene som kommer ut av en produksjonslinje, og at våre manufactoring ingeniører og kvalitetspersonell har en nærhet til enkelte fabrikker. En av de største utfordringene i klyngen vil jeg si er en underinvestering i avansert produksjonsteknikk, mens det har vært for mye fokus på å sette ut produksjon og drive mer med komplisert assembly her. Verftene har gjort dette med å begynne å sette bort seksjoner, etter hvert hele moduler og skrog. Om vi skal være en produksjonsklynge må vi ta i bruk ny produksjonsteknologi, samtidig som vi utøver standardiserte oppgaver.

10. Hvordan implementerer dere kvalitetskontroll igjennom verdikjeden?

Det er mange filter av kvalitetskontroll. Vi har kvalitetskontroll på underleverandører, vår egen produksjonskjede, og en sluttkontroll ute hos kunden. Å implementere system for kvalitetskontroll krever til tider en kulturendring og her tror jeg vi, som alle andre, har noen utfordringer.

11. Hvordan vil du vurdere selskapets evne til å bringe en ide til kommersiell produksjon?

Jeg tror vi er veldig innovative i konseptstadiet, og har en robust fremgangsmåte på dette. Litt av utfordringen vår er å få ting til å gå litt hurtigere, så kanskje vi kan ta litt større risikoer i enkelte tilfeller. Vi mangler kanskje litt laboratorietester, da vi fra design/prototype til utvikling i full skala har vi stolt mye på godt samarbeid med kunder på verft og rederi.

12 Hvordan går dere frem for å opprettholde gode relasjoner til selskapets kunder? Har dere en systematisert fremgangsmåte til CRM?

Ja, gjennom vår struktur har vi bygd opp en customer relationship management organisasjon. Her har vi definert noen strategiske viktige kunder, og hver av disse har sin egen key account manager. Vi har også et system som heter CRM on demand, hvor vi legger inn profilen til kundene våre med informasjon om deres behov. I tillegg prøver vi hele tiden å forbedre oss gjennom samtaler med kundene.

13. Måler dere kundetilfredshet? I så fall, hvordan innhenter dere denne informasjonen?

Vi kjører også ut systematiske kundeundersøkelser, hvor kundene svarer på en del spørsmål og rangerer oss på enkelte punkt. Når hver kontrakt er fullført har vi også det som blir kalt for et sluttoppgjør, hvor vi går igjennom problemer og situasjoner som har oppstått. I tillegg tilbyr vi en del kunder det vi kaller for accelerated quality programs, hvor vi går inn med et team for å løse problemer hurtig.

14. Hvordan vil du karakterisere selskapets omdømme? Og hvordan er deres omdømme sammenlignet med deres nærmeste konkurrenter?

Det er ingen tvil om at Rolls Royce er et sterkt merkenavn. Samtidig kommer mye av dette fordi Rolls Royce var stor innenfor bilproduksjon og etter hvert innenfor flyindustrien. Innenfor den maritime klyngen er det nok et merkenavn som er mer jevnstilt med andre. Fra våre kunder, får jeg tilbakemelding om at vår styrke er vår evne til å finne løsninger til problemer gjennom samarbeid og dialog.

15. Kan du fortelle oss hvordan dere kommunisere med leverandører?

Vi har en egen purchasing avdeling i selskapet. Her fokuserer vi mye på å opprettholde gode forhold med leverandørene. Ofte er det risikabelt å kun forholde seg til en leverandør, derfor forsøker vi å ha i minimum tre store leverandører. Til disse leverandørene jobber vi aktivt med å kommunisere hva som er våre forventninger i forhold til kvalitet og intern kontroll.

16. Har dere et system for å måle ansattes prestasjoner?

Ja det har vi. Det er formalisert slik at hver linjeleder som har sitt team, etablerer målsetninger til hver av sine ansatte. Det vil så være en oppfølgning på hvordan statusen til den enkelte ansatte er i forhold til de satte målene. Det avhenger litt av hvilken type jobb det er snakk om, men typisk sett er det en månedlige targets som er satt. Utover dette prøver vi også å ha et litt langsiktig perspektiv, ved å kartlegge en naturlig karrierevei til hver enkelt ansatt. Samtidig er det viktig å måle hva som er den totale prestasjonen til hver team, noe som hver leder også blir målt på. Med slike tiltak prøver vi å stimulere til at hver enkelt ansatt kan yte maksimalt innenfor det som han føler seg komfortabelt med.

17. Benchmarker" dere selskapets prestasjoner opp mot konkurrenter eller andre aktører?

Ja vi benchmarker viktige prestasjonsindikatorer opp mot relevante aktører i markedet. Spesielt viktig for oss er produktivitet, kostnader og salgsinntekter.

18. Hvordan går dere frem for å identifisere eksterne muligheter og trusler?

Dette blir gjort på mange nivå. Produkt managere har ansvar for den langsiktige inntjeningen og fortjenesten til et produkt. De har et ansvar for å benchmarke sin status og komme med forslag og handlingsplaner til forbedringer. En slik manager skal vite hva som foregår på teknologisiden, hva konkurrentene holder på med, og strategiske endringer i markedet.

19. Bruker dere kvantitative målsetninger i utarbeidelsen av strategiske planer (f. eks. balansert målstyring) ?

Vi har brukt et gjennomarbeidet sett av det vi kaller for key performance indicators. På marine har vi en del hoved indikatorer som er resultatet av hva vi skal oppnå i løpet av det neste året. Disser indikatorene, resulterer i en del strategiske program med sine milepæler. Måten vi utøver dette på er at vi delegerer toppnivået av målsetninger hele veien nedover i organisasjonen, slik at hver enkelt ansatt føler at han bidrar til samme mål og strategi. Om prestasjonene er off target, setter vi i gang tiltak og risikoevaluering.

20. Hvordan blir selskapets kjerneverdier kommunisert til de ansatte?

Vi har et tydelig sett av kjerneverdier, og har ofte opplæring om hva disse betyr. I tillegg får de ansatt årlige påminning om hva disse verdiene er. Vi kjører også en del workshops med forskjellige scenarioer og rollespill, for så å evaluere forskjellige potensielle situasjoner. Jeg tror vi er ganske opptatt av dette, og at det kan endre måten vi ansatte opptrer på og kulturen vår over tid, på en positiv måte. I mellom disse store workshopene kjører vi også mer dybdetrening i form av mindre kurs eller internett-trening.

21. Hvordan er selskapets produkt og/eller service kvalitet i forhold til deres nærmeste konkurrenter?

Kundene våre forteller, at vi enkelte ganger ikke responderer hurtig nok når det har oppstått et problem. Samtidig tror jeg at vi er veldig dyktig til å ha produkt som kunden kan stole på. Når noe ting skjer har det veldig store konsekvenser for kunden, da de produktene vi leverer er kritisk for at båten eller systemet skal fungere. Derfor blir det mye fokus på dette, og vi jobber kontinuerlig for å bli bedre. Vår benchmarking tilsier at vi på langt nær er noe dårligere enn våre konkurrenter, men sannsynligvis bedre enn dem når det gjelder kvalitet. Samtidig er det en balanse på hvor mye vi kan legge i ekstra innvesteringer for å forbedre bli bedre, kontra hva vi opplever kunden er villig til å betale for det. Kunde gruppen er heller ikke homogen og noen er mer opptatt av pris enn andre.

22. Har dere lansert noen varer og/eller tjenester de siste 5 årene som er nylanseringer eller betydelige teknologiske innovasjoner?

Ja det har vi. Blant annet har vi innenfor våre service segment videreutviklet monitorering av tilstanden til utstyr om bord i båter. Det vil si at vi kan ha modell hvor man tilbyr en viss antall operative timer per år på det produktet, med et avtalt sett av vedlikehold.

23. **I følge OECD scorer Norge lavt på tradisjonelle mål på innovasjon (f. eks. bevilgning av midler til FoU) i forhold til andre EU- land. Samtidig scorer Norge høyt på produktivitet og vekst. Dette fenomenet blir kalt det "Norske Paradokset".**

- **Hva tror du er de viktigste årsakene til dette paradokset?**

For meg er det en åpenbar forklaring til dette paradokset. Vi deltar i serie med EU-program som har høy investeringer, og vi deltar i mindre forskningsprogram der vi får støtte i fra norsk forskningsråd. Det vi ser er at om vi skal inn i et EU-program er det mye administrasjon og byråkrati. Blant disse virker det som om forskningen er i større grad for forskningen sin del. Vi er veldig opptatt av at det som vi gjør av FoU innenfor det norske systemet er lean, har en enkel og oversiktlig prosjektadministrasjon, og at hoveddelen pengene faktisk går til å skape noe. Derfor er de norske programmene

gjerne mindre, og EU-programmene krever ofte at man har 20 aktører involvert. Mange av aktørene er konkurrenter, så det er begrenset hva man får til i så store prosjekt. Det å ta det i fra teknologi til produkt tror jeg vi er mye flinkere på i Norge. Dette har litt med at det norske systemet er åpen for at du med noen få aktører kan ta en ide til en løsning med en relativt lav andel administrasjonskostnader. Jeg tror også vi er kjent for å ta større risiko, og er villige til å hurtigere komme frem med prototyper.

Det paradokset du snakker om kan også snus på hodet, ja vi får til mer med de midlene vi har, men om vi bevilget flere midler til færre program kunne vi fått mer innovasjon. Det ville løftet en del program som krever flere ressurser. Jeg tror også vi er kjent for å ta større risiko, og er villige til å hurtigere komme frem med prototyper. Også så tror jeg at de selskapene som ikke leverer går konkurs, siden vi er så få og like selskaper i Norge. Derfor er vi opptatt av når vi går inn i forskningsprosjekt så skal vi levere, og bidra til verdiskapning.

24. Er det noe du ønsker og legge til som ikke har blitt nevnt?

Nei, jeg føler at vi har gått dypt inn i de temaene dere har ønsket å snakke om.

Appendix 4: Interview with Sperre Industri

Dato: 10.02.2016
Navn: Nikolai Bjørge
Firma: Sperre industri
Stilling: Produktutvikler

1. **Hvordan vurderer dere teknologiske trender relevante for selskapet?**

Vi stiller på de viktigste messene innenfor salg og industri for og hele tiden å profilere oss og være ute hos kundene våre. Vi følger naturligvis med på hva konkurrentene gjør, men viktigst er det å se på hva markedet og kundene våre trenger. For å utvikle produktene i tråd med kundens behov har utviklingsavdelingen et tett samarbeid med salgsavdelingen. Den teknologiske trenden er preget av en økt grad av automasjon og kontrollmuligheter på produktene og dette er noe vi fokuserer og jobber hardt med for å henge med i toppen på.

2. **Samarbeider dere med andre aktører for å identifisere nye muligheter i forskjellige markeder? I så fall, hvilke aktører?**

Vi har et samarbeid med en annen kompressorleverandør som vi bruker for å kunne tilby komplette løsninger for starteluft og arbeidsluft om bord i båter. I den daglige driften på Ellingsøya så styrer vi oss selv, men under utviklingen av nye X-range kompressorene så var det en del konsulenter inne for å hjelpe oss med arbeidet rundt dette. Vi har og har hatt flere samarbeid med høyskoler/universitet tidligere.

3. **Hvordan vil du vurdere selskapets evne til å tilpasse teknologi til markedets behov?**

Jeg vil påstå at på dette feltet er vi flinke. Vi har en del bein å stå på når offshore nå har gått ned, har vi marine som er stabil, LNG øker, samtidig som vi nå satser stort på landbasert kraftverk siden det er stor nedgang på den andre siden. Vi er en bedrift lokalisert på Ellingsøya og en stor fordel for oss er at vi har produksjon og administrasjon i samme bygg, så vi har lett for å snu oss. Kort avstand mellom kontor og produksjon.

4. **I hvor stor grad tar dere hensyn til kunders tilbakemelding i videreutvikling av produkter og/eller tjenester?**

Dersom selgere ser en trend av forespørsler på et nytt produkt eller bare en videreutvikling av våres produkt jobber vi deretter for å tilfredsstille våres kunder. Vi på teknisk/utvikling følger også med på det som kommer inn av "claimer" fra kunder. Ser vi en tendens med mye "claimer" på samme del/produkt tar vi grep og analyserer årsaken til "claimene'' og forbedrer dersom nødvendig.

5. **Hvilken policy har dere på bevilgning av midler til utvikling av nye produkter og/eller tjenester?**

Ledelsen er veldig klar på at vi hele tiden skal utvikle nye produkt. Det er ikke en bunnløs konto men det satses en del på produktutvikling hele tiden.

6. **Anslagsvis, hvor stor andel av de ansatte jobber med utvikling av nye produkter og/eller tjenester?**

Vi er 2 ansatte som jobber 100% med utvikling og vedlikehold av våres produkt. På teknisk avdeling hvor vi sitter er vi 14 ansatte og alle hjelper alle. Vi har en elektroingeniør som også jobber litt med utvikling i tillegg til at vi har en mekaniker som hjelper oss ved behov.

7. **Hvilke krav stiller dere til utdanningsnivå og arbeidserfaring for ansettelse i ulike avdelinger?**

Kravene har økt de siste årene pga større fokus på utdanning og kunnskap. Gangen på Sperre har vært at man begynner på gulvet og jobber her en stund før man da eventuelt får rykke videre i systemet til f.eks. en plass på teknisk/salg/skipning etc. Sperre er kjent for lite gjennomtrekk og noen av de som jobber her nå har jobbet her i over 40 år. Vi har hatt en ansatt som har arbeidet for Sperre i over 50 år. De ansatte som har jobbet her lenge har enormt med kunnskap og erfaring noe som er essensielt når man enten er ute som selger eller sitter på teknisk og tar tekniske avgjørelser.

Nyansatte kan ofte bruke litt tid før de kommer seg inn i systemet og organisasjonen og det er derfor ikke alltid heldig med stor utskifting, spesielt i de teknisk krevende jobbene. Kunnskap og erfaring veier svært tungt for Sperre Industri AS.

8. **Tilbyr dere kurs og videreutdanning til deres ansatte?**

Ja, der blir tilbydd kursing i alt fra maskineringsprogram, 3D program, IT-verktøy, AutoCAD etc. De tilbyr alle i produksjonen å ta fagbrev noe som i år har gitt et stort løft til produksjonen. De har også gitt noen mulighet til å ta videreutdanning på deltid i kombinasjon med jobb for å øke kompetansen i organisasjonen.

9. **Hvordan jobber dere med å effektivisere produksjonsmetoder?**

Vi lager så mye som mulig selv. Vi har en stor maskinavdeling som er delvis robotisert, så på dagtid lader maskinarbeiderne magasina til roboten klar slik at på kveldstid produserer maskinen produktene så lager vi til siste rest dagen etter på dagtid. Hovedgrunnen til at kunder ofte velger oss er at de får deler innen 48 timer, uansett hvilke del det gjelder. Vist de kjøper en kompressor i dag garanterer vi deler 30 år frem i tid.

10. **Hvordan implementerer dere kvalitetskontroll i gjennom verdikjeden?**

Alt som er maskinert blir kontrollert i henhold til toleranse på tegninger og ofte så vet operatøren hva som er viktig. Så monterer og bygger vi selv før kompressorene går igjennom prøvekjøringen slik at eventuelle feil blir luket vekk her. Kunder får også en test record slik han vet at kompressoren leverer den kapasiteten han betaler for. Kunder stiller større og større krav til sertifisering og dokumentasjon og vi har på plass alle de tunge og viktige sertifiseringene og typegodkjenningene som gjør oss til en konkurransedyktig leverandør over hele verden.

11. **Hvordan vil du vurdere selskapets evne til å bringe en ide til kommersiell produksjon?**

Vi jobber mye med forbedring og oppfølging av våres produkt samtidig som vi jobber med utvikling av nye produkt og ideer. Vi leverer ca. 2000 kompressorer i året og det

kan være en omfattende prosess for oss å innføre en endring eller et nytt produkt med tanke på manualer, dokumentasjon, bestilling av deler, produksjon, informasjon til kunder etc.

12. **Hvordan går dere frem for å opprettholde gode relasjoner til selskapets kunder? Har dere en systematisert fremgangsmåte til CRM?**

Vi har et agentnettverk i hele verden, 200-250 stykker totalt. Vi har utekontor i Singapore, Shanghai og Rotterdam. Det er hoved havnene. Vi har 6 selgere med egne kontinent, som har sine relasjoner og nærhet til sine kunder.

13. **Måler dere kundetilfredshet? I så fall, hvordan innhenter dere denne informasjonen?**

Vi i Sperre industri har ikke noen måte å måle kundetilfredshet på, men på ettermarked så er vi medlem i noe som heter insentra som er en slags paraply organisasjon for ulike leverandører til marine/offshore. Når man er medlem her må man innfri visse kriterier. Her fikk vi status som nr. 1 på kundetilfredshet noe som er meget bra og vi selvsagt er veldig stolt av.

14. **Hvordan vil du karakterisere selskapets omdømme? Og hvordan er deres omdømme sammenlignet med deres nærmeste konkurrenter?**

Vi flyter litt på den med at vi er kjent for et veldig godt omdømme. Folk vet at Sperre fungerer år etter år. Skulle det mot formodning være et problem med produktet så får kundene våre deler i løpet av 48 timer. For oss er det viktig å få ut delene så fort som mulig og heller ta eventuelle spørsmålene senere. En kompressor er en kritisk komponent som må fungere for at skip skal få seile og det er derfor viktig at disse alltid er oppe å går.

15. **Kan du fortelle oss hvordan dere kommunisere med leverandører?**

Vi har en egen innkjøpsavdeling som har en del rammeavtaler med en viss levetid, i tillegg til automatiske bestillinger. Vi har et godt system for dette. I tillegg har de jevne

avtaler hvor de prøver å presse prisene til alternative leverandører. Vi lager det meste selv, men har begynt å outsource litt på maskineringen. For nå lager vi kanskje 10 stempel noe som er veldig dyrt å lage selv, mens vi i utgangspunktet kunne tenkt oss å lage 70. Derfor har vi begynt å outsource litt på maskinering siden. For å gjøre det mer effektivt "in house".

16. **Har dere et system for å måle ansattes prestasjoner?**

Ja vi følger opp viktige prestasjonsindikatorer kontinuerlig.

17. **"Benchmarker" dere selskapets prestasjoner opp mot konkurrenter eller andre aktører?**

Vi ser på konkurrenter hele tiden, hvilke ordre de får og hvilken pris de leverer til etc. Og da ser konkurrentenes taktikk, tjener de på de? Eller selger de med tap? For å holde oss inne på enkelte markeder har vi i noen tilfeller måttet solgt med tap for og ikke tape markedsandeler. Men vi ser på dette som en investering og ikke et tap.

18. **Hvordan går dere frem for å identifisere eksterne muligheter og trusler?**

Vi følger med på taktikken til andre konkurrenter, vurdere om vi skal gå på det samme selv. Trusler kan vær regelverk som feller oss. Men det er så innarbeidet at det tviler jeg på at skjer. Toll kan ofte være et problem, kultur kan være en problem, under rapportering fra kunder på "claimer" hvor det egentlig ikke er en feil men det er kunder som har brukt produktet feil.

19. **Bruker dere kvantitative målsetninger i utarbeidelsen av strategiske planer (f. eks. balansert målstyring) ?**

På prosjektavdelingen har vi en egen prosjektgruppe som setter opp mål vi skal nå og hva vi skal gjør. Disse målene blir så kommunisert til de relevante avdelingene. Så vi har en gjennomarbeidet plan med et lang tidsperspektiv. Men utvikling tar tid og vi må teste alt grundig før innføring i produksjon.

20. Hvordan blir selskapets kjerneverdier kommunisert til de ansatte?

Vi har jevnlige allmøte, hvor vi snakker om hvordan ting ligger an med tanke på budsjett, hva vi burde fokusere på etc.

21. Hvordan er selskapets produkt og/eller service kvalitet i forhold til deres nærmeste konkurrenter?

Servicen og produktene våre er beste i forhold til våre konkurrenter. Det koster oss en del og tilby det vi tilbyr, men dette ser vi på som en investering. På grunn av dette kan vi produsere i Norge, noe som egentlig er veldig ugunstig . Høye kostnadsnivå og kun nordmenn i produksjon. Fordelen er høy produkt kvalitet, og vi har alt samme plass og er veldig fleksible.

Pris er mer og mer viktig og redere er mindre og mindre lojale. Vi merker en økende konkurranse fra pirat deler på etter marked. Vi skal leve av vårt etter salg, men redere kjøper av konkurrenter som selger deler til halve prisen av det vi tilbyr. Så vårt dilemma er da om vi skal selge med tap og håpe at rederen er lojal eller selge med tap og risikere at de bruker pirat deler og vi dermed ikke får tent inn igjen tapet. Dette er et vanskelig dilemma. Derfor jobber selgerne hardt mot rederne for å få de mest mulig lojale mot vår bedrift.

22. Har dere lansert noen varer og/eller tjenester de siste 5 årene som er nylanseringer eller betydelige teknologiske innovasjoner?

I 2010, seks år siden kom vår nye X-range. Dette var en stor nylansering av en helt ny kompressorserie som dekker både luft og vannkjølt og alle kapasitetene som trengs i det marine markedet.

23. I følge OECD scorer Norge lavt på tradisjonelle mål på innovasjon (f. eks. bevilgning av midler til FoU) i forhold til andre EU- land. Samtidig scorer Norge høyt på produktivitet og vekst. Dette fenomenet blir kalt det "Norske Paradokset".

- **Hva tror du er de viktigste årsakene til dette paradokset?**

Det henger sammen med at de som utvikler her har gode erfaringer med avansert produksjon. Veien fra ide til kommersiell produksjon er mye kortere enn i andre land, og bedriftene her er mer sammen sveiset. Dette er spesielt tilfellet her på Sunnmøre hvor vi har alt på en plass. Korte avstander, dialog med samarbeidspartnere, konkurrenter stimulerer innovasjon her i klyngen og i landet generelt. Alle prater med alle og er veldig lite formelle noe jeg tror senker terskelen for ansatte til å komme med gode ideer som de kanskje sitter på. Raskere til å få frem prototyper og luke vekk dårlig ideer. Vi er mer effektive enn andre land.
Vi har alt. Fiskeri startet alt, så kom verftene, offshore osv. Er veldig spent på hva verftene skal ta seg til nå som det er dårlige tider og de går tom for arbeid. Er de fleksible nok til å snu seg? Vi på Sunnmøre har store fordeler med kysten og nærheten til leverandørene hjelper veldig.

24. Er det noe du ønsker og legge til som ikke har blitt nevnt?

Nei, i utgangspunktet er det ikke det.

Appendix 5: Questionnaire

Innovasjonsevnen til maritime utstyrsleverandører i Møre og Romsdal

1. Hvilken kommune hører selskapet til?

2. Hvor mange ansatte er det i selskapet?

Fyll inn antall ansatte i Møre og Romsdal.

3. Hvilken avdeling i selskapet er du ansatt?

- ◯ Daglig leder / adm.dir
- ◯ Administrasjon
- ◯ Produksjon
- ◯ Salg
- ◯ Kommunikasjon
- ◯ Annet

4. Hva var bedriftens omsetning i 2014?

Fyll inn hele beløpet i NOK.

5. I prosent, hvor stor endring i omsetning er dette fra året før?

Anvend -/+ avhengig av om endring i omsetningen representerer en nedgang/økning (f.eks. +20).

6. Hvordan vil du bedømme selskapets evne til å:

Rangeres fra 1 (svært dårlig) til 7 (svært god)

	1- Svært Dårlig	2	3	4	5	6	7- Svært God
Vurdere teknologiske trender relevant for bedriften?	○	○	○	○	○	○	○
Tilpasse teknologi slik at det samsvarer med markedets behov?	○	○	○	○	○	○	○
Samarbeide med andre aktører for å identifisere muligheter innen forskjellige markedssegment?	○	○	○	○	○	○	○
Investere i utvikling av nye produkter og/eller tjenester?	○	○	○	○	○	○	○
Effektivt kommunisere forskning og utvikling (FoU) aktiviteter på tvers av de ulike avdelingene?	○	○	○	○	○	○	○
Anvende kunders tilbakemeldinger i teknologisk utvikling?	○	○	○	○	○	○	○
Spesifisere klare mål og planer for forskningsprosjekter?	○	○	○	○	○	○	○
Ansette kvalifiserte ansatte til de forskjellige avdelingene?	○	○	○	○	○	○	○
Innvilge tilstrekkelige ressurser til kurs og videreutdanning av ansatte?	○	○	○	○	○	○	○
Innvilge tilstrekkelige ressurser til produkt og systemutvikling?	○	○	○	○	○	○	○
Implementere effektive produksjonsmetoder?	○	○	○	○	○	○	○

Videreutvikle et prosjekt fra FoU til kommersiell produksjon?	◯	◯	◯	◯	◯	◯	◯
Implementere kvalitetskontroll igjennom verdikjeden?	◯	◯	◯	◯	◯	◯	◯
Generere gjennomførbare ideer for produktutvikling?	◯	◯	◯	◯	◯	◯	◯
Etablere gode relasjoner til kunder?	◯	◯	◯	◯	◯	◯	◯
Opprettholde et positivt omdømme?	◯	◯	◯	◯	◯	◯	◯
Innhente informasjon om ulike segment i markedet?	◯	◯	◯	◯	◯	◯	◯
følge opp kunders behov etter salg?	◯	◯	◯	◯	◯	◯	◯
Kordinnere FoU, marked og produksjons aktiviteter?	◯	◯	◯	◯	◯	◯	◯
Håndetere flere tids og ressurs-krevende prosjekter parallelt?	◯	◯	◯	◯	◯	◯	◯
Kommunisere med leverandører og kunder?	◯	◯	◯	◯	◯	◯	◯
Måle ansattes prestasjoner?	◯	◯	◯	◯	◯	◯	◯

Identifisere organisatoriske styrker og svakheter?	◯	◯	◯	◯	◯	◯	◯
Anvende strategiske planer ved hjelp av kvantitative målsetninger (f.eks. balansert målstyring)?	◯	◯	◯	◯	◯	◯	◯
Formidle selskapets overordnede mål og kjerneverdier til de ansatte?	◯	◯	◯	◯	◯	◯	◯

7. Anslagsvis, hvor stor prosentandel av selskapets ansatte jobber med forskning og utvikling (FoU) ?

Gyldige verder er fra 0 til 100. Det er ikke tillat med desimaler eller tegn.

8. Hvor stor prosentandel av selskapets varer og/eller tjenester de siste tre årene er nylanseringer, eller betydelige teknologiske innovasjoner?

Gyldig verdier er 0-100. Det er ikke tillatt med desimaler eller tegn.

9. Hvordan vil du vurdere selskapets posisjon i forhold til deres nærmeste konkurrent, med tanke på følgende faktorer:

	1-Svært dårlig	2	3	4	5	6	7-Svært god
Produkt/service kvalitet?	◯	◯	◯	◯	◯	◯	◯
Kostnadsnivå?	◯	◯	◯	◯	◯	◯	◯
Utviklingstid fra FoU til kommersiell produksjon?	◯	◯	◯	◯	◯	◯	◯

10. Hvor viktig er andre lokale aktører for den økonomiske prestasjonen til selskapet ?

Med lokale aktører mener vi selskap (f.eks. Leverandører, Kunder og Konkurrenter) med hovedkontor lokalisert i Møre og Romsdal.

- ◯ Ikke viktig i det hele tatt
- ◯ Litt viktig
- ◯ Ganske viktig
- ◯ Svært viktig
- ◯ Ekstremt viktig

11. Hvilke aktører er viktigst for selskapet?

Med lokale aktører mener vi selskap (f.eks. Leverandører, Kunder og Konkurrenter) med hovedkontor lokalisert i Møre og Romsdal. Nasjonale aktører er selskap med hovedkontor lokalisert i andre fylker enn Møre og Romsdal. Internasjonale aktører er selskap med hovedkontor lokalisert utenfor Norge.

- ◯ Lokale aktører
- ◯ Nasjonale aktør
- ◯ Internasjonale aktører
- ◯ Ingen av delene

12. Hvor viktig mener du samspill mellom lokale aktører er for innovasjonsevnen til selskap i den maritime klyngen i Møre og Romsdal?

Med lokale aktører mener vi selskap (f.eks. Leverandører, Kunder og Konkurrenter) med hovedkontor lokalisert i Møre og Romsdal.

- ◯ Ikke viktig i det hele tatt
- ◯ Litt viktig
- ◯ Ganske viktig
- ◯ Svært viktig
- ◯ Ekstremt viktig

Takk for at du deltok i denne undersøkelsen! Husk å tykk på "Ferdig" for å sende inn resultatene.

Ferdig

Appendix 6a: E-mail to survey respondents

Hei,

Vi er to studenter fra NTNU i Ålesund hvor vi tar en mastergrad i internasjonal business og markedsføring. I forbindelse med vår mastergradsavhandling gjennomfører vi en spørreundersøkelse om innovasjonsevnen til utstyrsleverandører i den maritime klynga i Møre og Romsdal. Spørreundersøkelsen tar **maks** 10 minutter å gjennomføre og vi setter stor pris på om du tar deg tid til delta. Undersøkelsen vil kun bli brukt til akademiske formål og alle svar vil selvfølgelig bli behandlet konfidensielt.

Link til undersøkelsen:

https://no.surveymonkey.com/r/5FF288X

Om du har spørsmål om spørreundersøkelsen, ta gjerne kontakt på telefon: 916 33 583/ 938 20 699 eller e-mail: Tobias_torheim@hotmail.com/

På forhånd, tusen takk!

Med Vennlig Hilsen
Tobias Torheim & Michelle Wiig
NTNU i Ålesund

Appendix 6b: Reminder e-mail

Hei,

Dette er en påminnelse, det er svært viktig at du deltar ved å svare på denne undersøkelsen som kartlegger innovasjonsevne i ei næring som gjennomgår stor omstilling. Spørreundersøkelsen tar mellom 5-8 minutter. Vi setter stor pris på din deltagelse

Vi er to masterstudenter fra NTNU i Ålesund. I forbindelse med vår mastergradsavhandling gjennomfører vi en spørreundersøkelse om innovasjonsevnen til utstyrsleverandører i den maritime klynga i Møre og Romsdal. Undersøkelsen vil kun bli brukt til akademiske formål og alle svar vil bli behandlet konfidensielt. Om du allerede har svart på undersøkelsen kan du se bort i fra denne e-mailen.

Link til undersøkelsen:

https://no.surveymonkey.com/r/5FF288X

Om du har spørsmål om spørreundersøkelsen, ta gjerne kontakt på telefon: 916 33 583/ 938 20 699 eller e-mail: Wiig_Michelle92@hotmail.com

På forhånd, tusen takk!

Med Vennlig Hilsen
Tobias Torheim & Michelle Wiig
NTNU i Ålesund

Appendix 7: Dependent variables tested for normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Percentage of the company`s products/services the last three years, representing innovations	,220	74	,000	,822	74	,000
The firm`s position compared to its rivals in regards to product/service quality	,245	74	,000	,851	74	,000
The firm`s position compared to its rivals in regards to cost levels	,165	74	,000	,927	74	,000
The firm`s position compared to its rivals in regards to development time from R&D to commercial production	,150	74	,000	,939	74	,001
Change of turnover in percentage	,264	74	,000	,760	74	,000

Appendix 8: Factor and reliability analysis

8a: Learning capability

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,668
Bartlett's Test of Sphericity	Approx. Chi-Square	92,024
	df	3
	Sig.	,000

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2,245	74,844	74,844	2,245	74,844	74,844
2	,519	17,312	92,156			
3	,235	7,844	100,000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
Firm`s capability to evaluate technological trends	,917
Firm`s capability to adapt technology to match market needs	,874
Firm`s capability to collaborate with actors	,800

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Communalities

	Initial	Extraction
Firm`s capability to evaluate technological trends	1,000	,840
Firm`s capability to adapt technology to match market needs	1,000	,764
Firm`s capability to collaborate with actors	1,000	,641

Extraction Method: Principal Component Analysis.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,826	,830	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Firm`s capability to evaluate technological trends	9,4824	4,846	,776	,633	,663
Firm`s capability to adapt technology to match market needs	9,3243	5,702	,694	,565	,755
Firm`s capability to collaborate with actors	9,5364	5,287	,597	,375	,854

8b: R&D capability

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,826
Bartlett's Test of Sphericity	Approx. Chi-Square	141,735
	df	6
	Sig.	,000

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2,889	72,228	72,228	2,889	72,228	72,228
2	,484	12,101	84,329			
3	,353	8,819	93,148			
4	,274	6,852	100,000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
Firm`s capability to communicate R&D activities across divisions	,886
Firm`s capability to specify goals and plans	,868
Firm`s capability to invest in new product/service development	,855
Firm`s capability to apply customer feedback in the innovation process	,787

Extraction Method: Principal Component Analysis.

Communalities

	Initial	Extraction
Firm`s capability to communicate R&D activities across divisions	1,000	,786
Firm`s capability to invest in new product/service development	1,000	,731
Firm`s capability to apply customer feedback in the innovation process	1,000	,620
Firm`s capability to specify goals and plans	1,000	,753

Extraction Method: Principal Component Analysis.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,871	,871	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Firm`s capability to invest in new product/service development	13,3243	12,770	,731	,544	,833
Firm`s capability to communicate R&D activities across divisions	13,8784	12,026	,779	,620	,813
Firm`s capability to apply customer feedback in the innovation process	12,9730	13,287	,641	,411	,868
Firm`s capability to specify goals and plans	13,7027	12,349	,750	,578	,825

8c: Resource capability

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,720
Bartlett's Test of Sphericity	Approx. Chi-Square	81,480
	df	3
	Sig.	,000

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2,243	74,750	74,750	2,243	74,750	74,750
2	,418	13,929	88,680			
3	,340	11,320	100,000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
Firm`s capability to employ qualified and educated personell	,848
Firm`s capability to allocate sufficient founds to new product and process development	,866
Firm`s capability to allocate sufficient founds to further education of personell	,879

Extraction Method: Principal Component Analysis.

Communalities

	Initial	Extraction
Firm`s capability to employ qualified and educated personell	1,000	,719
Firm`s capability to allocate sufficient founds to new product and process development	1,000	,750
Firm`s capability to allocate sufficient founds to further education of personell	1,000	,773

Extraction Method: Principal Component Analysis.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,831	,831	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Firm`s capability to employ qualified and educated personell	8,4459	6,990	,663	,441	,793
Firm`s capability to allocate sufficient founds to further education of personell	8,8784	6,437	,715	,513	,741
Firm`s capability to allocate sufficient founds to new product and process development	8,5676	6,495	,693	,485	,763

8d: Manufacturing capability

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,775
Bartlett's Test of Sphericity	Approx. Chi-Square	112,964
	df	6
	Sig.	,000

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2,667	66,679	66,679	2,667	66,679	66,679
2	,633	15,835	82,514			
3	,396	9,909	92,423			
4	,303	7,577	100,000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
Firm`s capability to implement efficient methods of production	,856
Firm`s capability to progress a resarch project to commercial production	,852
Firm`s capability to implement quality control throught the value chain	,725
Firm`s capability to generate feasible product development ideas	,826

Extraction Method: Principal Component Analysis.

Communalities

	Initial	Extraction
Firm`s capability to implement efficient methods of production	1,000	,733
Firm`s capability to progress a resarch project to commercial production	1,000	,727
Firm`s capability to implement quality control throught the value chain	1,000	,526
Firm`s capability to generate feasible product development ideas	1,000	,682

Extraction Method: Principal Component Analysis.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,831	,832	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Firm`s capability to implement efficient methods of production	13,4324	12,084	,721	,526	,761
Firm`s capability to progress a resarch project to commercial production	13,5135	10,774	,709	,549	,766
Firm`s capability to implement quality control throught the value chain	13,2838	13,685	,545	,330	,834
Firm`s capability to generate feasible product development ideas	13,1622	12,220	,678	,489	,779

8e: Marketing capability

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,783
Bartlett's Test of Sphericity	Approx. Chi-Square	174,481
	df	6
	Sig.	,000

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2,985	74,628	74,628	2,985	74,628	74,628
2	,487	12,179	86,807			
3	,369	9,226	96,033			
4	,159	3,967	100,000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
Firm`s capability to maintain a positive reputation	,918
Firm`s capability to establish good relationship with its customers	,877
Firm`s capability to meet customers needs after sales	,840
Firm`s capability to obtain knowledge of different market segment s	,818

Extraction Method: Principal Component Analysis.

Communalities

	Initial	Extraction
Firm`s capability to establish good relationship with its customers	1,000	,768
Firm`s capability to maintain a positive reputation	1,000	,843
Firm`s capability to meet customers needs after sales	1,000	,705
Firm`s capability to obtain knowledge of different market segment s	1,000	,669

Extraction Method: Principal Component Analysis.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,885	,886	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Firm`s capability to establish good relationship with its customers	14,9595	11,108	,763	,694	,848
Firm`s capability to maintain a positive reputation	15,1043	10,429	,834	,754	,820
Firm`s capability to obtain knowledge of different market segment s	15,4962	11,410	,689	,482	,875
Firm`s capability to meet customers needs after sales	15,6043	10,686	,718	,533	,866

8f: Organizing capability

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,722
Bartlett's Test of Sphericity	Approx. Chi-Square	85,221
	df	6
	Sig.	,000

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2,424	60,599	60,599	2,424	60,599	60,599
2	,720	18,006	78,605			
3	,533	13,333	91,938			
4	,322	8,062	100,000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
Firm`s capability to measure the performance of its employees	,841
Firm`s capability to handle multiple projects in parallel	,805
Firm`s capability to communicate with suppliers and customer s	,763
Firm`s capability to coordinate R&D, marketing and production activities	,698

Extraction Method: Principal Component Analysis.

Communalities

	Initial	Extraction
Firm`s capability to coordinate R&D, marketing and production activities	1,000	,487
Firm`s capability to handle multiple projects in parallel	1,000	,648
Firm`s capability to communicate with suppliers and customer s	1,000	,582
Firm`s capability to measure the performance of its employees	1,000	,708

Extraction Method: Principal Component Analysis.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,782	,781	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Firm`s capability to coordinate R&D, marketing and production activities	13,7181	10,855	,499	,277	,773
Firm`s capability to handle multiple projects in parallel	13,3803	10,120	,615	,469	,715
Firm`s capability to communicate with suppliers and customer s	12,9054	10,279	,572	,332	,737
Firm`s capability to measure the performance of its employees	13,9208	9,241	,668	,503	,685

8g: Strategic capability

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,747
Bartlett's Test of Sphericity	Approx. Chi-Square	145,530
	df	6
	Sig.	,000

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2,779	69,471	69,471	2,779	69,471	69,471
2	,590	14,747	84,219			
3	,462	11,552	95,770			
4	,169	4,230	100,000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
Firm`s capability to identify external opportunities and threats	,887
Firm`s capability to identify internal strengths and weaknesses	,892
Firms`s capability to apply strateigc plans with quantifiable milestones	,801
Firm`s capaiblity to communicate its goals and core values to the staff	,745

Extraction Method: Principal Component Analysis.

Communalities

	Initial	Extraction
Firm`s capability to identify external opportunities and threats	1,000	,786
Firm`s capability to identify internal strengths and weaknesses	1,000	,796
Firms`s capability to apply strateigc plans with quantifiable milestones	1,000	,642
Firm`s capaiblity to communicate its goals and core values to the staff	1,000	,555

Extraction Method: Principal Component Analysis.

Reliability Statistics

Cronbach's Alpha	N of Items
,848	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Firm`s capability to identify external opportunities and threats	12,7913	11,646	,757	,779
Firm`s capability to identify internal strengths and weaknesses	12,8683	11,326	,767	,773
Firms`s capability to apply strateigc plans with quantifiable milestones	13,2508	11,482	,652	,822
Firm`s capaiblity to communicate its goals and core values to the staff	12,5987	11,983	,585	,851

8h: Cluster interaction

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,628
Bartlett's Test of Sphericity	Approx. Chi-Square	63,483
	df	3
	Sig.	,000

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2,025	67,503	67,503	2,025	67,503	67,503
2	,675	22,506	90,009			
3	,300	9,991	100,000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component 1
Importance of local actors for the economic performane of the firm	,887
The importance of collaboration between local actors for the innovative capaiblity of the maritime cluster in MR	,865
Overall, the most important actors for the comapny	-,701

Extraction Method: Principal Component Analysis.

Communalities

	Initial	Extraction
Importance of local actors for the economic performane of the firm	1,000	,786
The importance of collaboration between local actors for the innovative capaiblity of the maritime cluster in MR	1,000	,748
Overall, the most important actors for the comapny	1,000	,491

Extraction Method: Principal Component Analysis.

Reliability Statistics

Cronbach's Alpha	N of Items
,821	2

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
The importance of collaboration between local actors for the innovative capaiblity of the maritime cluster in MR	3,4324	1,071	,697	.
Importance of local actors for the economic performane of the firm	3,6757	,989	,697	.

8i: Firm performance

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,761
Bartlett's Test of Sphericity	Approx. Chi-Square	87,248
	df	10
	Sig.	,000

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2,508	50,157	50,157	2,508	50,157	50,157
2	1,016	20,325	70,482			
3	,599	11,976	82,457			
4	,486	9,718	92,176			
5	,391	7,824	100,000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
The firm`s position compared to its rivals in regards to development time from R&D to commercial production	,829
The firm`s position compared to its rivals in regards to cost levels	,798
The firm`s position compared to its rivals in regards to product/service quality	,745
Percentage of the company`s products/services the last three years, representing innovations	,671
Change of turnover in percentage	,423

Extraction Method: Principal Component Analysis.

Communalities

	Initial	Extraction
The firm`s position compared to its rivals in regards to development time from R&D to commercial production	1,000	,687
The firm`s position compared to its rivals in regards to product/service quality	1,000	,556
The firm`s position compared to its rivals in regards to cost levels	1,000	,636
Change of turnover in percentage	1,000	,179
Percentage of the company`s products/services the last three years, representing innovations	1,000	,450

Extraction Method: Principal Component Analysis.

Reliability Statistics

Cronbach's Alpha	N of Items
,788	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
The firm`s position compared to its rivals in regards to product/service quality	9,0000	8,082	,593	,751
The firm`s position compared to its rivals in regards to cost levels	9,8108	6,840	,635	,705
The firm`s position compared to its rivals in regards to development time from R&D to commercial production	9,9189	6,678	,663	,673

Appendix 9: Regression analyses

9a: Model I

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,836[a]	,699	,667	,73593

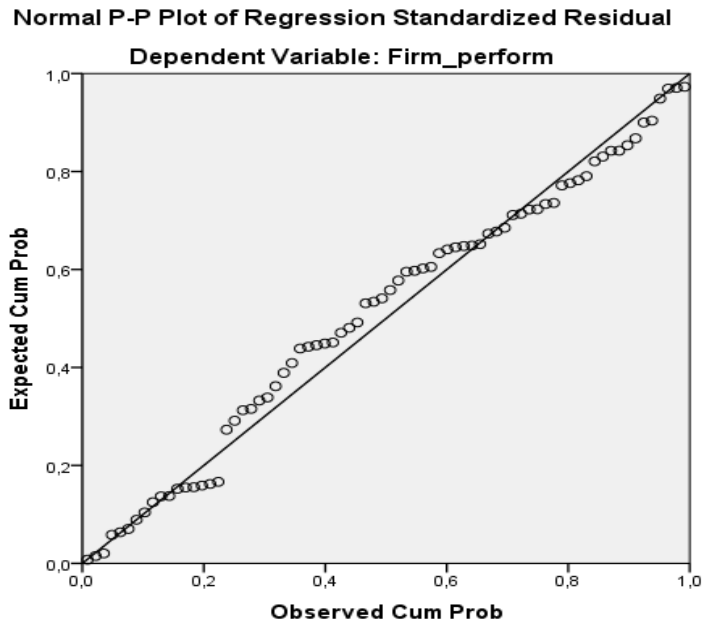
ANOVA[a]

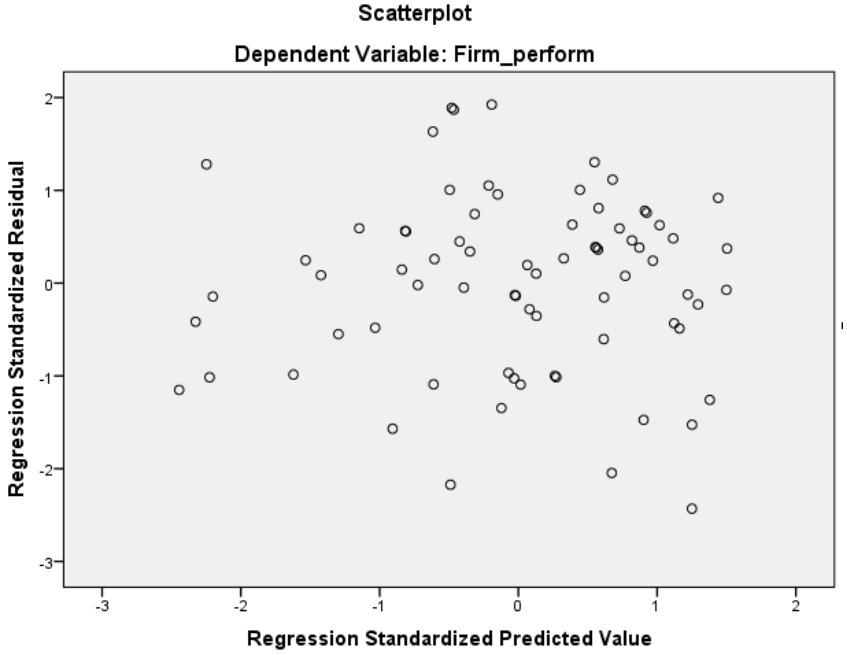
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	83,050	7	11,864	21,906	,000[b]
	Residual	35,745	66	,542		
	Total	118,794	73			

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	-,497	,453		-1,096	,277		
	Learning_Capability	,073	,141	,063	,518	,606	,305	3,274
	RD_Capability	,032	,170	,029	,186	,853	,192	5,211
	Resourcea_Capability	-,196	,126	-,190	-1,562	,123	,307	3,253
	Manufacturing_Capability	,380	,178	,337	2,139	,036	,184	5,448
	Marketing_Capability	,490	,112	,415	4,385	,000	,510	1,961
	Organizing_Capability	,311	,156	,250	1,995	,050	,291	3,437
	Strategicplaning_Capability	,014	,131	,012	,109	,914	,351	2,849
	Adjusted R-Square: .667							
	F: 21.906 (P=.000)							

a. Dependent Variable: Firm_perform


Normal P-P Plot of Regression Standardized Residual
Dependent Variable: Firm_perform
Expected Cum Prob
Observed Cum Prob
0,0
0,2
0,4
0,6
0,8
1,0


Scatterplot
Dependent Variable: Firm_perform
Regression Standardized Residual
Regression Standardized Predicted Value
-3
-2
-1
0
1
2

9b: Model II

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,852[a]	,727	,688	,71219

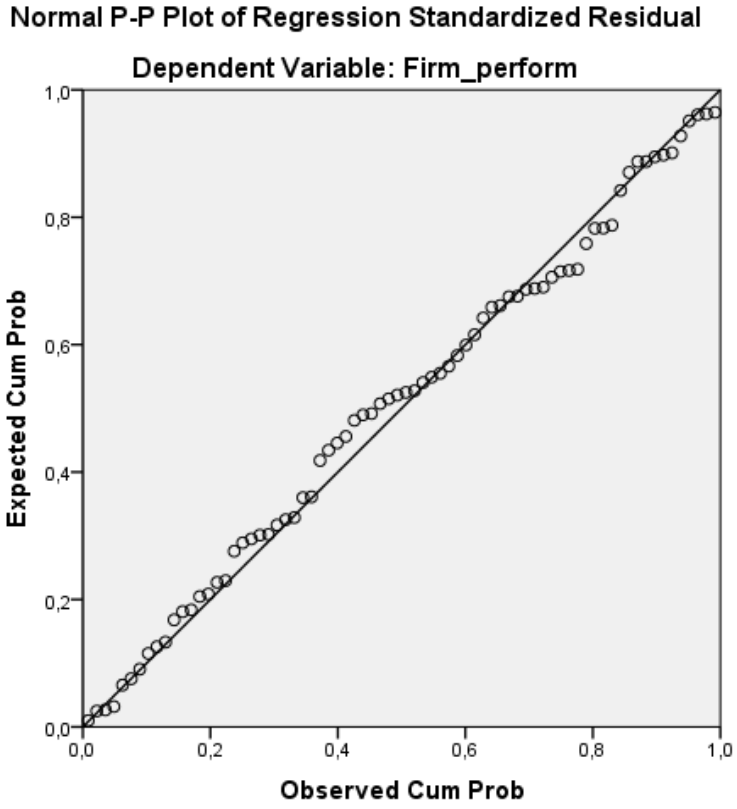
ANOVA[a]

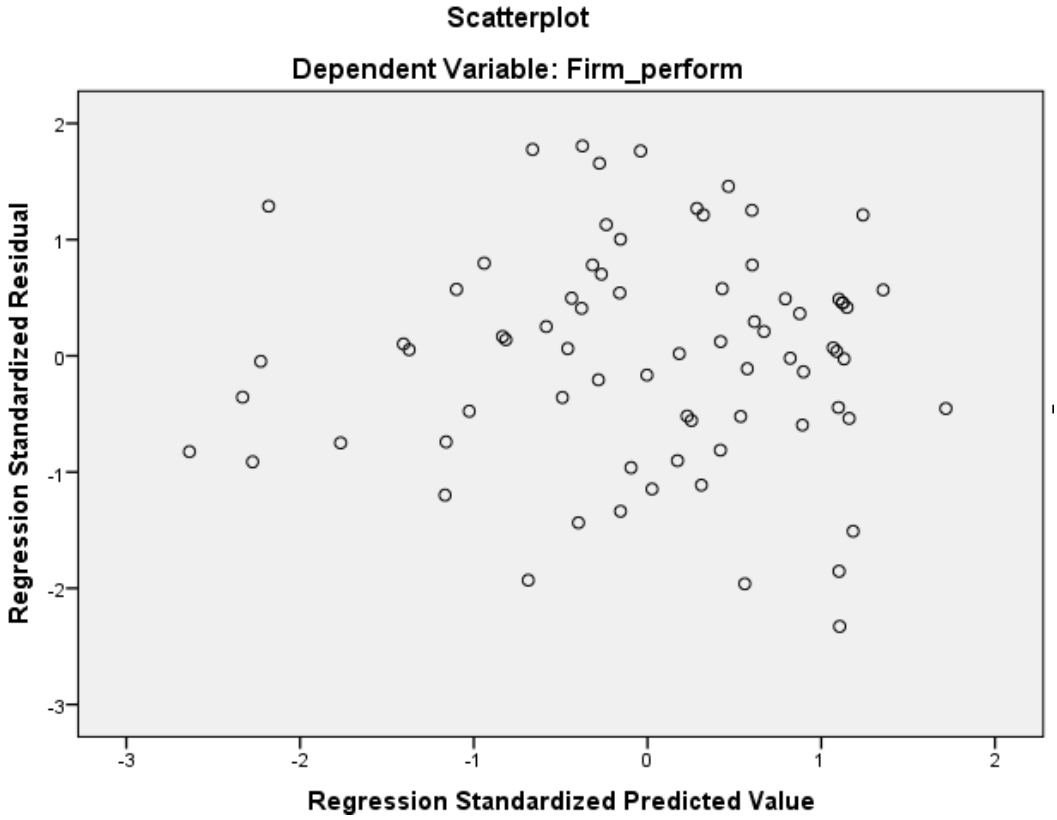
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	86,333	9	9,593	18,912	,000[b]
	Residual	32,462	64	,507		
	Total	118,794	73			

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
2	(Constant)	4,788	,093		51,398	,000		
	(Cluster) x Resource Capability	,403	,169	,526	2,386	,020	,111	9,004
	(Cluster) x Manufacturing Capability	,697	,214	,902	3,254	,002	,170	9,206
	(Cluster) x Marketing Capability	,279	,129	,380	2,161	,034	,175	5,710
	Learing_Capability	,178	,180	,153	,985	,328	,176	5,679
	RD_Capability	,084	,166	,077	,506	,614	,187	5,357
	Resourcea_Capability	-,197	,125	-,191	-1,578	,199	,291	3,433
	Manufacturing_Capability	,357	,178	,317	2,010	,049	,172	5,819
	Marketing_Capability	,420	,113	,355	3,723	,000	,469	2,134
	Organizing Capabilty	,348	,15	,28	2,28	,026	,28	3,51
	Strateigcplanning_Capability	,043	,15	,03	,282	,78	,24	4,40
	Adjusted R-Square: .688							
	F: 18,912 (P = .000)							

a. Dependent Variable: Firm_perform


Normal P-P Plot of Regression Standardized Residual
Dependent Variable: Firm_perform
Expected Cum Prob
Observed Cum Prob
0,0
0,2
0,4
0,6
0,8
1,0


Scatterplot
Dependent Variable: Firm_perform
Regression Standardized Residual
Regression Standardized Predicted Value
-3
-2
-1
0
1
2

Appendix 10: SPSS codebook

Variable	SPSS Variable Name	Code
Municipality of the Firm	Municipal	1= Molde, 2= Ålesund, 3= Kristiansund, 4= Vanylven, 5= Sande, 6= Herøy, 7= Ulstein, 8= Hareid,9= Volda, 10= Ørsta, 11= Ørskog,12= Norddal, 13= Stranda, 14=Stordal, 15= Sykkylven, 16= Skodje, 17= Sula, 18= Giske, 19= Haram, 20= Vestnes, 21= Rauma, 22= Nesset, 23= Midsund, 24= Sandøy, 25= Aukra, 26= Fræna, 27= Eide, 28= Averøy, 29= Gjemnes, 30= Tingvoll, 31= Sunndal, 32= Surnadal, 33= Ringdal, 34= Halsa, 35= Smøla, 36= Aure
Number of Employees	Employees	Number of employees
Department	Department	1= CEO/ Executive, 2= Administration, 3= Production, 4= Sales, 5= Communication, 6= Other
Turnover in 2014	Turnover	Turnover in NOK
Change in turnover from previous year	Changeturnover	Change in percentage from previous year
The company´s capability to evaluate technological trends relevant for the firm	Capaevaluate	1= Very poor, 2= Poor, 3= Somewhat poor, 4= Neither Poor Nor Good, 5= Good, 6= Very Good, 7= Excellent.
The company´s capability to adapt technology to match market need	Capailityadapt	1= Very poor, 2= Poor, 3= Somewhat poor, 4= Neither Poor Nor Good, 5= Good, 6= Very Good, 7= Excellent.
The company´s capability to collaborate with other actors to identify opportunities in different market segments	Capacollaborate	1= Very poor, 2= Poor, 3= Somewhat poor, 4= Neither Poor Nor Good, 5= Good, 6= Very Good, 7= Excellent.
The company´s capability to efficiently communicate R&D	Capacommunicate	1= Very poor, 2= Poor, 3= Somewhat poor, 4= Neither Poor Nor Good,

activities across divisions		5= Good, 6= Very Good, 7= Excellent.
The company´s capability to apply customer´s feedback in the innovation process	Capafeadback	1= Very poor, 2= Poor, 3= Somewhat poor, 4= Neither Poor Nor Good, 5= Good, 6= Very Good, 7= Excellent.
The company´s capability to specify clear goals and plans for research projects	Capagoals	1= Very poor, 2= Poor, 3= Somewhat poor, 4= Neither Poor Nor Good, 5= Good, 6= Very Good, 7= Excellent.
The company´s capability to employ qualified and educated personnel	Capaqualified	1= Very poor, 2= Poor, 3= Somewhat poor, 4= Neither Poor Nor Good, 5= Good, 6= Very Good, 7= Excellent.
The company´s capability to allocate sufficient founds to further education of personnel	Capafurthereducation	1= Very poor, 2= Poor, 3= Somewhat poor, 4= Neither Poor Nor Good, 5= Good, 6= Very Good, 7= Excellent.
The company´s capability to allocate sufficient founds to new product and process development	Capaproductdevelopment.	1= Very poor, 2= Poor, 3= Somewhat poor, 4= Neither Poor Nor Good, 5= Good, 6= Very Good, 7= Excellent.
The company´s capability to implement efficient methods of production	Capaproductionmethods	1= Very poor, 2= Poor, 3= Somewhat poor, 4= Neither Poor Nor Good, 5= Good, 6= Very Good, 7= Excellent.
The company´s capability to progress a research project to commercial production	Capaprogress	1= Very poor, 2= Poor, 3= Somewhat poor, 4= Neither Poor Nor Good, 5= Good, 6= Very Good, 7= Excellent.
The company´s capability to implement quality control through the value chain	Capaqualitycontrol	1= Very poor, 2= Poor, 3= Somewhat poor, 4= Neither Poor Nor Good, 5= Good, 6= Very Good, 7= Excellent.
The company´s capability to generate feasible product development ideas	Capaideatoproduction	1= Very poor, 2= Poor, 3= Somewhat poor, 4= Neither Poor Nor Good, 5= Good, 6= Very Good, 7= Excellent.
The company´s capability to establish good relationship with its customers	Capacustomerrelationship	1= Very poor, 2= Poor, 3= Somewhat poor, 4= Neither Poor Nor Good, 5= Good, 6= Very Good, 7= Excellent.
The company´s capability to maintain a	Capabilityreputation	1= Very poor, 2= Poor, 3= Somewhat poor, 4=

positive reputation.		Neither Poor Nor Good, 5= Good, 6= Very Good, 7= Excellent.
The company´s capability to obtain knowledge of different market segments	Capabilityknowledge	1= Very poor, 2= Poor, 3= Somewhat poor, 4= Neither Poor Nor Good, 5= Good, 6= Very Good, 7= Excellent.
The company´s capability meet customers needs after sales	Capabilityaftersales	1= Very poor, 2= Poor, 3= Somewhat poor, 4= Neither Poor Nor Good, 5= Good, 6= Very Good, 7= Excellent.
The company´s capability to coordinate R&D, marketing and production activities.	Capacoordinateactivities	1= Very poor, 2= Poor, 3= Somewhat poor, 4= Neither Poor Nor Good, 5= Good, 6= Very Good, 7= Excellent.
The company´s capability to handle multiple time and resource consuming projects in parallel	Capamultipleprojects	1= Very poor, 2= Poor, 3= Somewhat poor, 4= Neither Poor Nor Good, 5= Good, 6= Very Good, 7= Excellent.
The company´s capability to communicate with suppliers and customers	Capacommunication	1= Very poor, 2= Poor, 3= Somewhat poor, 4= Neither Poor Nor Good, 5= Good, 6= Very Good, 7= Excellent.
The company´s capability to measure the performance of its employees	Capatrackperformance	1= Very poor, 2= Poor, 3= Somewhat poor, 4= Neither Poor Nor Good, 5= Good, 6= Very Good, 7= Excellent.
The company´s capability to identify external opportunities and threats	Capaeopportunities	1= Very poor, 2= Poor, 3= Somewhat poor, 4= Neither Poor Nor Good, 5= Good, 6= Very Good, 7= Excellent.
The company´s capability to identify internal strengths and weaknesses	Capastrenghts	1= Very poor, 2= Poor, 3= Somewhat poor, 4= Neither Poor Nor Good, 5= Good, 6= Very Good, 7= Excellent.
The company´s capability to apply strategic plans with qualitative milestones (E.g. Balanced Scorecard).	Capastrategicplans	1= Very poor, 2= Poor, 3= Somewhat poor, 4= Neither Poor Nor Good, 5= Good, 6= Very Good, 7= Excellent.
The company´s capability to communicate its goals and core values to the staff	Capacommunicategoals	1= Very poor, 2= Poor, 3= Somewhat poor, 4= Neither Poor Nor Good, 5= Good, 6= Very Good, 7= Excellent.

Percentage of employees working with development of new products or services.	Employnewdevelopment	Percentage of total employees.
Percentage of the company's products/ services the last three years, representing new launches or significant technological innovations.	Newlaunchesorinnovations	Percentage of company´s total products/services.
The company´s position compared to its rivals in regards to product/service quality.	Productandservicequality	1= Very poor, 2= poor, 3= somewhat poor, 4= Neither poor nor good, 5= Good, 6= Very good, 7= Excellent.
The company´s position compared to its rivals in regards to cost levels.	Costlevels	1= Very poor, 2= poor, 3= somewhat poor, 4= Neither poor nor good, 5= Good, 6= Very good, 7= Excellent
The company´s position compared to its rivals in regards to development time from R&D to commercial production	Developmenttime	1= Very poor, 2= poor, 3= somewhat poor, 4= Neither poor nor good, 5= Good, 6= Very good, 7= Excellent
Importance of local actors for the economic performance of the company	Importancelocalactors	1= Not important, 2= Somewhat important, 3= Moderately important, 4= Very important, 5= Extremely important
Overall, the most important actors for the company.	Mostimportantactors	1= Local firms, 2= national firms, 3= International firms, 4= Neither.
The importance of collaboration between local actors for the innovative capability of the firms in the cluster.	Collaborationlocalactors	1= Not important, 2= Somewhat important, 3= Moderately important, 4= Very important, 5= Extremely important