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INTERNATIONAL MARKETING AND MANAGEMENT

-The Northern Sea Route-
A viable option for the Norwegian shipping industry?

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Abstract

Global warming is causing Arctic sea ice to melt and previously ice-covered seas are now opening up for commercial navigation. Consequently shipping companies have started to consider the potential to find shorter transit routes between Europe and Asia. It has been argued that the Northern Sea Route holds the potential to become a viable alternative to the Suez Canal for cargo shipments between Europe and Asia. In theory this route can offer a distance saving as high as 50 per cent, and no country is more conveniently located to take advantage of this than Norway.

The purpose of this thesis is to examine whether the Northern Sea Route is a viable option, and how the Norwegian shipping industry best can position itself to take advantage of the potential opportunities this offers. To be able to examine this, we first characterize the main benefits and challenges related to the Northern Sea Route. This is followed by an examination of the basis of the Norwegian Shipping industry’s competitive advantage.

Our conclusion is that the Northern Sea Route currently is not a viable option; however it is likely to be a viable option in the future. Accordingly, the Norwegian shipping industry should acquire the necessary knowledge and expertise through close collaboration with knowledgeable representatives from the maritime cluster in Norway. The Norwegian shipping industry is well positioned to be able to benefit from the highly knowledge intensive cluster they are a part of. This will further enable the Norwegian shipping industry to be well prepared if and when the route becomes more viable.
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1. Introduction

Global warming is causing Arctic sea ice to melt and previously ice-covered seas are now opening up for commercial navigation. Consequently shipping companies all over the globe have started to consider the potential to find shorter sea routes between Europe and Asia. There are currently two routes that shipping companies have started to evaluate; The Northern Sea Route and the Northwest Passage. The Northern Sea Route is the route that is gaining most traction as a seasonal alternative route. 71 vessels sailed through the Northern Sea Route in 2013, compared to 46 in 2012, which indicates that the use of the route already has become more attractive (www.barentsobserver.com).

Research results, which have been published during the last 10-15 years, have consistently shown that the Arctic ice has been gradually decreasing and thinning over the last few decades. There are however uncertainties regarding the pattern and pace of the melting, and predictions of future ice levels differ greatly (Lykke, 2008).

As the ice is melting there are three main areas of particular interest for the shipping industry, these are related to offshore energy extraction, destination shipping, and transit shipping. For the purpose of this paper the focus will be on transit shipping between Europe and Asia via the Northern Sea Route. Transiting through waters along the coast of Russia is now open for passage for a period of time during the summer and autumn. Climate conditions associated with the long-term trend towards increased global temperatures has rendered the Northern Sea Route largely ice-free for a limited time each year.

Rising energy prices and fuel costs remain a great challenge for the shipping industry. Costs and fuel consumption management is essential and may involve a range of strategies, one of which is selection of the most economical routing options (Stopford, 2009). Just looking at the map shows a significant saving in distance that can be achieved by the Arctic routes, and thus potentially also in time and expenses.
Figure 1: The Northwest Passage & The Northern Sea Route

A trip between London and Yokohama using the Northern Sea Route is 13,841 kilometers, which is significantly shorter than the trip using the Suez Canal (21,200 kilometers). The trade route between Asia and Europe remains one of the main channels of world trade, therefore the shipping industry has started to ask what the commercial potential of the route is. In theory, distance savings can be as high as 50% compared to the currently used shipping lanes via the Suez or Panama Canal (Lykke, 2008).

It has been argued that the Northern Sea Route holds a potential to become an alternative to the Suez Canal for cargo shipment between Europe and Asia. However, not everybody agrees about the potential of the new Arctic sea route. In their paper Lassere and Pelletier (2011) investigate shipowner’s intentions to start sailing the different Arctic routes. The authors surveyed 98 shipping companies operating in the Northern Hemisphere, and concluded that “Arctic passages will not become the new Panama of the 21st century”. They do however recognize the increased traffic along the Northern Sea Route, and that the potential for this route is stronger that for the Northwest Passage (Lassere & Pelletier, 2011:1472). Whilst Khon et al. (2010), on the other hand, states that the year-around transit costs for shipping via the Northern Sea Route between Western Europe to east of Asia could potentially be 15 per cent lower compared with transit via the Suez Canal, indicating that shipping companies could greatly benefit from choosing the Arctic route. This shows that not everybody agrees about the potential of the new Arctic sea routes.

In this paper we will investigate Norwegian shipowner’s believes and intentions in relation to the Northern Sea Route. To our knowledge, such a study has not previously been conducted. Norway has a unique strategic location close to the Arctic region, and unique maritime competencies. The opportunities in the north are many and Norway and the Norwegian shipping industry must take
initiative to insure long-term and proper management of resources. It is important to focus on industry standards, regulations and competencies, and measure this against resource potential, infrastructure needs and investments. Benefiting from Arctic opportunities will require extensive research, knowledge development and new insights.

The maritime industry in Norway employs around 100,000 people and creates NOK 150 billion in value per annum. The industry still offers huge potential for further growth. The Norwegian shipping industry has demonstrated an ability to create a world leading knowledge based cluster characterized by a unique ability to innovate and create value. The combination of shipping companies with expertise in new requirements and an effective industrial cluster is the main reason for the maritime industry’s present standing. The shipping companies and their owners, through a constant search for better and more efficient solutions are the main drivers of the industry (Stø Kurs 2020, 2013).

1.1 Motivation for choice of research area

During the 3rd semester the researchers attended a course on Developments in International Shipping. One of the topics covered by this course was the rise of new segments and routes. The lecture focused the Northern Sea Route and the Northwest Passage and their potential to become viable commercial alternatives to the already established “highways” of the sea i.e. Suez and Panama Canal. The Northern Sea Route was identified to hold a greater potential than the Northwest Passage. We found this topic highly intriguing and wanted to explore more. This was the motivational foundation for the researchers to write a thesis on opportunities in relation to the Northern Sea Route.

Furthermore, our search for information relating to Arctic opportunities and the Northern Sea Route, led us in the direction of the Norwegian shipping industry. The Arctic region and the Northern Sea Route has received much attention in Norway, both from industry related organizations i.e. The Norwegian Shipowners Association, research institutes, and the Norwegian government. Taking into account that Norway has a strategic location in proximity to the Arctic, and the existence of competencies in relation to Arctic operations within Norway, examining the
Northern Sea Route from a Norwegian perspective appeared highly relevant.

1.2 Purpose of the study and Research Question

As previously mentioned, global warming is causing Arctic sea ice to melt and previously ice covered seas are now opening up and enabling the possibility of commercial navigation. This has been a hot topic in the media and it has fueled many speculative scenarios and analysis in academic literature. Much of the literature on the subject has driven the idea that Arctic routes are bound to attract abundant traffic in the future. However, as previously mentioned not everybody agrees about the potential of the new Arctic sea routes (Lasserre and Pelletier, 2011).

Maritime strategy is an important part of the Norwegian government’s efforts to strengthen the competitiveness of Norwegian businesses and make it easier and more profitable to do business in Norway. The Norwegian government has decided to present a new strategy for the maritime industry in Norway. The plan is to present a strategy with a comprehensive policy for growth and value creation for the maritime industry in spring of 2015. The driving force behind this initiative is the goal for the Norwegian maritime industry to sustain their competitive position in the world market. The government is currently working on developing the strategy, focusing on how the industry can respond to future challenges and opportunities (www.regjeringen.no).

The above information clearly depicts the relevance of investigating the Northern Sea Route. Additionally, the high focus in Norway on maintaining future competitiveness for the maritime industry provided us with a more precise approach on how to investigate the Northern Sea Route. This led us to develop the following overall research question:

*Is the Northern Sea Route a viable option? And, how can the Norwegian shipping industry best position itself to take advantage of the potential opportunities this will offer?*

Shipping companies all over the world are faced with the same opportunity to sail along the Northern Sea Route. Companies’ prior knowledge and competencies might however position them differently, and affect their ability to seize potential opportunities. Therefore the purpose of this thesis is to investigate the viability of the Northern Sea Route. Further, we will investigate whether
Norwegian shipping companies might be in a position to benefit from the opportunities the Northern Sea Route potentially could offer. Furthermore, to be able to investigate this, we will start by investigating the potential of the Northern Sea Route and its characteristics. Some guiding research questions were defined for this purpose:

- What are the main benefits related to sailing along the Northern Sea Route?
- What are the main challenges related to sailing along the Northern Sea Route?
- Is the Norwegian shipping industry in possession of knowledge and capabilities required to benefit from this new business opportunity?

1.3 Structure

Here, the structure of our thesis will be presented. Our thesis is divided into 7 chapters.

In chapter 1, an introduction to our thesis will be presented. The chapter includes an introduction to the thesis and the problem definition. This will give the reader a clear understanding of the topic of the thesis.

In chapter 2, we will present our methodology by defining our research philosophy, reasoning of our choice of research design, distinguishing between primary and secondary data collection, define the difference between quantitative and qualitative data, and present how these different data are collected and managed. This chapter is the basis for how the authors pursue and manage the thesis’ area of research. It is important that the authors handle the data collected according to standards, which will ensure validity and reliability to the thesis.

In chapter 3, a review of the global and Norwegian shipping industry will be presented. After presenting the industry the authors will present the Arctic region and its characteristics. Who owns it, does the Arctic climate have any effect on the shipping industry, Arctic port facilities and infrastructure, Arctic activities and special regulations in relation to sailing in the Arctic region will be presented.

In chapter 4, the authors will present relevant theory used to create the basis for further analysis and discussion. To analyze the Norwegian shipping industry’s current position, a theoretical framework
consisting of cluster theory, Michael Porter’s Diamond of National Advantage, and theories explaining the importance of resources, capabilities and knowledge will be presented. The authors also included a section on industry change, which will be used to analyze the nature of change, and whether or not Norwegian shipping companies are facing a “game-changing” alteration of the industry.

In chapter 5, the authors present a summary of the data collected through the questionnaire. The data will also be further discussed and applied in chapter 6.

In chapter 6, theories and collected data are applied to analyze the case of the Northern Sea Route and the Norwegian shipping industry. The concluding chapter 7 contains the author’s discussion of the main findings and concluding remarks. In this chapter the research question will be answered.
2. Methodology

This section will begin with a brief description and discussion of our general research philosophical standpoint and research approach chosen. This will be followed by an introduction of our research design. Furthermore, we will distinguishing between primary and secondary data collection, define the difference between qualitative and quantitative data, and present how data will be collected and managed. Our analyses will be based on data gathered through a questionnaire, which will be send to different Norwegian shipping companies, interviews, articles, reports, multiple online resources and academic literature. Therefore, it is important that the researchers ensure that the data collected is handled according to standards. This will ensure reliability and validity in the analysis.

2.1 Research philosophy

Research is based on reasoning and observations, and the relationship between the two is part of an old and on-going debate on the development of knowledge (Blumberg, Cooper, and Schindler, 2011). In order to clarify the research design, the underlying philosophical thoughts of this study will be explained. According to Malhotra, Birks and Wills (2012), there are two eminent research philosophies: positivism and interpretivism. Both these philosophies have been argued to be valid in conducting research and help shape the nature of techniques that researchers apply.

In positivism the world exists externally and is objectively viewed. Positivists argue that knowledge is developed through investigation of social reality by observing objective facts. The researcher is independent and acts as an objective analyst. This implies that different researchers observing a certain phenomenon will arrive at the same conclusion. On the other hand, interpretivists see knowledge development as something that happens through development of ideas introduced from the observed and interpreted social constructions. In other words, the world is socially constructed and behavior is context and time specific. Researchers are involved as part of what is observed, which means that the researchers are not independent of their own feelings and understandings (Blumberg, Cooper, and Schindler, 2011).
To understand the phenomena investigated, positivists believe that an objective and singular view of the world is most suitable. On the other hand, interpretivists have an opinion that a subjective and multiple view of the reality is the preferred choice. Further, interpretivists opinion is that value-laden (biased) research is the most suitable way to see how people interpret the world. This will influence the way questions are asked and how answers are interpreted afterwards (Malhotra, Birks and Wills, 2012).

In addition to the two distinct philosophies described above, a third philosophy exists, namely realism. Realism incorporates characteristics from both positivism and interpretivism, which means that realism use principles from both philosophies (Blumberg, Cooper and Schindler, 2011).

It is important to choose the correct research philosophy. For the purpose of this thesis the realism philosophy will be used, as we see the need for both objective and subjective studies through qualitative and quantitative data collection. Normally a questionnaire is quantitative and would follow a more positivistic philosophy. However, our questionnaire have a dominant-less dominant design which entails both quantitative and qualitative measures.

2.2 Research Design

Research design may be exploratory or conclusive. In conclusive research the objective is to describe a specific phenomenon, to test specific hypotheses and examine specific relationships. This is done through pre-planned, formal and structured research. The information needed for conclusive research needs to be clearly specified. Conclusive research is normally based on large representative samples and the data collected is the subject of quantitative analysis. Descriptive research is a part of the conclusive design, and the main objective of descriptive design is to describe something, usually market characteristics or functions (Malhotra, Birks and Wills, 2012).

On the other hand, the main objective in exploratory research is to provide insights and understanding of a certain phenomenon. When the subject of the study cannot be measured in quantitative terms or where the measurement process cannot realistically represent particular qualities, exploratory research can be used. Exploratory research is also suitable for situations
where you need a more precise definition of the problem situation, where relevant courses of action needs to be identified, or additional insights are needed. In situations where the information needed is loosely defined and where research questions rather than specific hypotheses are formed, exploratory research is the preferred design (Malhotra, Birks and Wills, 2012).

A research project may involve more than one type of research design and serve several purposes. Hence, a multi-method research design may be used (Malhotra, Birks and Wills, 2012).

To investigate the topic of this thesis we use a multi-method research design. A descriptive design will be used when investigating the characteristics of the Norwegian shipping industry and the characteristics of the Arctic region and the Northern Sea Route. The source of information and data for this part of the thesis will be secondary data.

In this thesis there are two phases of exploratory research. The researchers’ level of knowledge on the subject at hand was limited when the research was initiated. Hence, exploratory research was the initial step. In addition, as we seek to gain insights and understanding about Norwegian shipowners’ believes and intentions, data that would not be possible to gain through a conclusive study, exploratory design will also be used for this purpose. Furthermore our study will follow a loosely structured and evolutionary approach. This implies that we start by developing an understanding of the situation. When new ideas and insights are revealed, the direction of the preceding research may be defined. The direction of the investigation may shift several times, as new insights are discovered (Malhotra, Birks and Wills, 2012).

2.3 Data collection method

When we are to define data, there are two main generic classifications: primary and secondary data. Selection of the type of data that is needed and most suitable to collect have to be carefully considered. In this thesis both primary and secondary data is collected and studied in order for us to be able to conduct a thorough analysis. In the following section we will give an introduction to the different data collection methods used.
2.3.1 Primary Data

Malhotra, Birks and Wills (2012) define primary data as: “data originated by the researcher specifically to address the research problem”. In other words, the researchers collect primary data for the purpose of addressing the specific problem at hand. These data are custom made for the particular topic under investigation, which have significant relevant and accuracy for the study (Malhotra, Birks and Wills, 2012).

Primary data can be both qualitative and quantitative. To decide which approach to follow the researcher must find the method that gives the most accurate measurement and understanding. A qualitative approach uses an unstructured, primarily exploratory design based on small samples and the intention is to provide insight, depth and understanding of the problem at hand. On the other hand, a quantitative approach use techniques that seek to quantify data, and typically apply some form of measurement and statistical analysis. It can be said that it is the definition of the problem that decides which approach should be used, although often both approaches are used (Malhotra, Birks and Wills, 2012). By combining qualitative and quantitative research methods in the same study, the researcher is applying mixed method research (Bryman and Bell, 2011).

For the topic of this thesis we find that there exists a wide range of easily accessible secondary data. However, we also see the need for some primary data. The primary data needed is context specific and no similar data, to the researchers’ knowledge, exist. For us to be able to analyze the viability of the Northern Sea Route, and the Norwegian shipping industry, we first wanted to explore Norwegian shipowners’ attitudes and intentions towards the route. This research was conducted using a mixed methods design, as we saw the need for both in order to answer the research problem sufficiently. Using mixed methods will lead to descriptively rich data, as well as quantitatively meaningful data (Lee, 1999). The primary data was collected through a survey. Although a survey or a questionnaire normally follows a quantitative approach, we chose to use a mixed design, containing both quantitative and qualitative elements. Furthermore, primary data was also collected through interviews, which is a qualitative method.
2.3.2 Secondary Data

Secondary data is data that has already been collected for other purposes than the problem at hand. Compared to primary data, secondary data is easier to access, inexpensive and quickly obtained. Some limitations related to secondary data is that it has been collected for other purposes than the problem at hand. Therefor the relevance and accuracy can be limited, hence the researchers must evaluate the secondary data’s usefulness before using it in the analysis (Malhotra, Birks and Wills, 2012).

Secondary data can be collected through multiple online resources, academic literature and articles. We gathered a large portion of secondary data for the purpose of gaining insight, depth and understanding of the problem at hand. This data was then used to formulate the research question for this study. The insight and understanding gained through secondary data also clarified what kind of primary data we needed to collect. Furthermore, secondary data, in the form of previously performed analysis and reports closely related to the subject of this study, will also be used in the analysis of our research. The researchers have carefully evaluated the different sources applied for the collection of secondary data and are confident that only reliable sources have been used.

2.4 Questionnaire design

A survey or a questionnaire is one technique for obtaining primary data. A questionnaire is defined as “A structured technique for data collection consisting of a series of questions, written or verbal, that a participant answers” (Malhotra, Birks and Wills, 2012). The main goal is to gather valuable information from the participants, information that will help the researchers answer the problem at hand. In a questionnaire there are three specific objectives. First, it is important for the researchers to develop questions that the participant can and will answer and it is highly important that these questions yields the desired information. Second, it is important that the questionnaire motivates and encourages the participants to answer the questions given to them. Third, the questionnaire should minimize response error, which means the error that arises when the participant give inaccurate answers or if their answers are mis-recorded or mis-analyzed (Malhotra, Birks and Wills, 2012).
When constructing the questionnaire the researchers followed a ten-step questionnaire design process given by Malhotra, Birks and Wills (2012).

![Figure 2: Questionnaire design process](image)

Malhotra, Birks and Wills, 2012

By following these guidelines the researchers minimize the risk of response error, design questions that will yield the desired information and design a questionnaire that motivates the participant to answer and complete the survey.

The survey was chosen for its simplicity advantages. The alternative of conducting interviews with equally many participants, would be too time consuming and difficult. Also, we believe that a survey will supply us with satisfactory information on the subject.

The questionnaire is both quantitative and qualitative; therefore one can say it has a dominant-less dominant design (Lee, 1999). The first part of the questionnaire has questions with fixed response alternatives. In the last part there are more open questions. These are included to get better insight into the respondents’ attitudes and intentions.
2.5 Sampling

The objective with our questionnaire is to gather information about and from our target population. The target population is defined as “the collection of elements or objects that possess the information sought by the researcher and about which inferences are to be made” (Malhotra, Birks and Wills, 2012:496). If the population is defined wrong it can lead to ineffective and misleading research. We defined our target population by defining the terms of elements, sampling units, extent, and time. We translated the problem at hand into a precise statement of who should and who should not participate in the sample. A sample is defined as “A subgroup of the elements of the population selected for participation in the study” (Malhotra, Birks and Wills, 2012:495).

In our study, our research is based on the Norwegian shipowners’ attitudes and intentions in relation to the Northern Sea Route. Therefore, shipping companies that directly operate their own ships or charter vessels were surveyed. Companies leasing their ships to carriers are excluded since the purpose of this study is to collect information from companies that make the decisions on which sea routes their ships will take, whether or not they own the vessels involved.

2.6 Validity and reliability

Malhotra, Birks and Wills (2012) define validity as “the extent to which a measurement represents characteristics that exist in a phenomenon under investigation”. In other words, how well you measure what you intended to measure. When conducting a study, it is regarded as valid if it collects the required data that is needed to answer the research question (Blumberg, Cooper and Schindler, 2011). Reliability can be defined as “the extent to which a scale produces consistent results if repeated measurement are made on the characteristics.” In other words, how well can you trust your results. The validity and reliability of the study is important because if these factors are excluded, the study can be misleading and confusing, which means that the study have little or none real value (Malhotra, Birks and Wills, 2012).
2.7 Fieldwork and data collection

A complete list of potential participants was prepared based on certain criteria. Participants had to be; a Norwegian shipping company, the company must operate vessels, the vessels must be involved in transit shipping (companies involved in offshore support activities were excluded), and the company has to operate vessels on routes also outside of Norway. The complete list consists of 50 companies that satisfy all the criteria.

The questionnaire was administered in the program surveymonkey. When the questionnaire was ready we directly contacted the pre-defined potential participants by calling them. We asked to be put in contact with decision makers that could answer the questionnaire. The next step was to e-mail the questionnaire to the participants. Out of the 50 companies that were invited to participate, 32 answered.

2.8 In-depth interviews

An in-depth interview is a personal interview with a single participant, where the researchers goal is to uncover underlying motivations, beliefs, attitudes and feelings on the topic at hand. The conversation usually and preferable resembles the form of talking you find among friends. As the name implies, in-depth interviews seeks deeper information and understanding, and therefor thrust and respect is important (Malhotra, Birks and Wills, 2012).

In-depth interviews can be structured, unstructured, or semi-structured. We will use the semi-structured interview form. The characteristic of a semi-structured interview is that it is a mix between the unstructured and structured interview forms. It has themes, targeted issues and specific questions prepared, but the interviewer is free to ask questions that emerge under the interview (Lee, 1999).

The use of industry experts as interview objects is common and widely used in research. Industry experts can help the researchers explore ideas and make new connections between already existing ideas (Malhotra, Birks and Wills, 2012). For the purpose of this thesis we wanted to include the
perspectives of industry experts on certain topics. Several possible interview objects were contacted and asked to participate. This included industry experts from the Norwegian Government, the Norwegian Shipowners Association, the Fridjof Nansen Institute, the Green Warriors of Norway (Miljøvernforbundet), and Pierre Cariou Professor at Kedge Business School.

Two interviews were conducted. The first with Pierre Cariou, was conducted via e-mail. Pierre Cariou is a professor in Shipping and Port Economics at the Kedge Business School in Marseille, visiting professor at Shanghai Maritime University and the World Maritime University in Malmö. He also held the French chair in Maritime Affairs in Malmö. His main research interests are shipping/port economics and maritime safety and environmental protection (www.wmu.se). The second interview was with Arild Moe, Deputy Director and Senior Research Fellow at Fridjof Nansen Institute. His main research interest is Russian oil and gas industry, the regional dimension in the Russian petroleum sector, offshore activities in the Barents Sea, Russian climate politics, Arctic politics, Norwegian policies in the high north and Arctic shipping (www.fni.no). This interview was held over the phone. In advance of the interview we prepared an interview guide, which you can find in appendix 2.

2.9 Limitations

Although this research was carefully prepared, it still has some limitations and shortcomings. First, due to the difficulties in achieving contact with experts within the field of study, we ended up with two interviews, which were conducted by e-mail and through a phone interview. By using phone interview it is difficult for the researchers to get the interview object to further elaborate on his responses. The phone interview was limited by time, due to the reason that the respondent only could participate in a short interview. Therefore, the questions were short and they were answered relatively briefly. Disadvantages with the e-mail interview are that it removes the chance of forcing the participant to answer spontaneously; the participant could take his time and reflect on the questions. It also has the same disadvantages as phone interview by decreasing the participant’s willingness to elaborate further on his answers. However, we still feel that we received valuable and relevant information that was important for the thesis. An advantage of conducting the expert interview by phone is that it was very convenient for the participant. Convenience is something we
realized in the process of writing this thesis was an important factor to increase participant’s willingness to participate in interviews.

Secondly, when we started the process of writing this thesis our goal was to collect beliefs and attitudes amongst Norwegian actors, on the topic of the potential commercial navigation along the Northern Sea Route. Our goal was to interview or question representatives from various influential institutions. This included the Norwegian government, academics with knowledge on the subject, the shipping industry and an environmental organization or institution. This proved to be challenging. Breaking contact barriers and getting in touch with people that could bring relevant information to the table was both time consuming and difficult.
3. Review of the Shipping Industry and the Arctic Region

3.1 The Shipping Industry

For thousands of years shipping has served the world economy, and during these years it has developed into a provider of sophisticated transport service to every part of the globe. The world fleet is now registered in over 150 nations, and operated by over a million seafarers of largely every nationality, making it a truly international industry (www.ics-shipping.org).

The industry has come a long way since the epic voyages of Bartolomeu Dias, Christopher Columbus, Vasco da Gama and Ferdinand Magellan opened the maritime highways of the world. Today, the same pioneering spirit has brought supertankers, container-ships, and a complex fleet of specialised vessels, which each year transport a ton of cargo for every person in the world (Stopford, 2009).

With about three-quarters of the earth’s surface covered by water it is obvious that shipping plays a major role in world trade. In fact the industry has an impact on each and every one of us by transporting the food we eat, the clothes we wear, the cars we drive, the materials used for building our homes, and the fuel that heats them (Lorange, 2009).

In other words, the entire world relies on ships to move its international trade. Without shipping the import and export of goods on the scale necessary for the modern world would not be possible. In fact, approximately 90% of all internationally traded goods and commodities are carried at some point by a ship, therefore, the strategic economic importance of maritime transport as a trade enabler cannot be overemphasized (www.ics-shipping.org). The trade competitiveness of all countries – developed and developing alike, depends heavily on effective access to international shipping services and port networks. Shipping by sea is also the most cost effective, efficient and environmentally friendly option for most cargo. In 2012 the world fleet, consisting of over 50 000 merchant ships, achieved a new record for seaborne trade-volume when it carried over 9 billion tonnes of cargo (www.balticexchange.com).
Maritime transportation is a complex environment, which involves both challenges and opportunities. Of all the prevailing challenges the issues of energy security and costs, climate change, and environmental sustainability are perhaps the most important. Climate change in particular has received considerable attention and is of high importance on the international policy agenda, including that of shipping and port businesses (UNCTAD, 2013).

The opportunities, on the other hand, include – to name a few – growing diversification of sources of supply, deeper regional integration, and access to new markets, facilitated by improved transportation networks (for instance the Panama Canal expansion) and cooperation agreements (UNCTAD, 2013).

During the last century the shipping industry has experienced a general trend of increase in trade volumes. Growing industrialisation and the liberalisation of national economies have fuelled free trade and a growing demand for consumer products. Also, advances in technology have made shipping an increasingly efficient and rapid method of transportation. Over the last four decades total seaborne trade estimates have quadrupled, from just over 8 thousand billion tonne-miles (ton-mile: a unit of freight transportation equivalent to one ton of freight transported one mile) in 1968 to over 32 thousand billion tonne-miles in 2008 (www.ics-shipping.org).

The shipping industry has experienced extraordinary changes over the past decades. Globalisation, deregulation, dispersed manufacturing of goods, logistics reforming and containerisation have been some of the major drivers of change (Lorange, 2009). Long-term economic growth and persistent globalization promotes trading through specialisation and development of vertical production chains across countries. Today, companies divide their operations across the world, from the design of the product, to the production of its components, to assembly and marketing, creating international production chains. This has created new opportunities for international shipping, and resulted in the need for more sophisticated logistics and transportation services (Stø kurs 2020, 2013). Other factors such as transit-time, marketing advantage of faster delivery, and reliability of delivery schedules has become some of the success factors in today’s shipping industry (Lorange, 2009).
As with all industrial sectors, however, shipping is susceptible to economic downturns. Following several years of incredibly lucrative shipping markets, much of the international shipping industry fell prey to the worldwide economic downturn. Shipping is inherently a servant of the economy, consequently the downturn in trade, following the beginning of the credit crisis in late 2008, translated into a sudden reduction in demand for shipping (www.ics.shipping.org).

Nevertheless the current situation depicts a positive outlook for the long-term development of the industry. The world’s population continues to expand, and alongside this expansion emerging economies will continue to increase their requirements for goods and raw materials, creating more business for shippers. As the below graph illustrates, the volume of world trade carried by sea has steadily increased in recent years. Seen from a long-term perspective, the fact that shipping is the most fuel-efficient and carbon friendly form of commercial transportation should work in favour of an even greater proportion of world trade being carried by sea (www.ics.shipping.org).

Figure 3: World seaborne trade
3.2 The Norwegian Shipping Industry

Norway, with just 5 million inhabitants, home to less than one-thousandth of the world population, is nonetheless one of the leading maritime nations in the world. The Norwegian fleet is actually the world's 5th largest in terms of value, the 6th largest measured in number of vessels, and 8th largest in terms of tonnage. Moreover, 90 per cent of all Norwegian vessels operate outside of Norway (www.regjeringen.no).

Today, the industry employs about 105 000 Norwegians in different sectors of the industry (www.rederi.no). An indicator for the economic significance the maritime industry has in Norway is that the industry represents almost 10 percent of the total value creation in the country, and crates value of some 150 billion NOK per annum, half of which stems directly from shipping activities (Maritime Outlook Report, 2013). The industry is also highly significant for the local and regional value creation and employment in Norway (Stø kurs 2020, 2013).

In contrast to nations that have specialist strengths in one or two specific areas of the industry, the Norwegian industry is among the most comprehensive and covers a vast area of services, products and expertise (www.regjeringen.no). The maritime industry in Norway consists of a large merchant marine fleet, shipyards, ship equipment manufacturers, ship consultants, and a plethora of other companies and institutions with maritime oriented activities. Strong interdependencies between actors in the various parts of the maritime sector and an emphasis on innovation and
entrepreneurship have historically contributed to define a strong and dynamic maritime cluster (Benito et al., 2003). The current standing is a demonstration of the Norwegian maritime industry’s ability to create a world leading maritime cluster based on knowledge. The industry is characterised by an unparalleled ability to innovate and create value (Maritime Outlook Report, 2013).

The Norwegian economy has performed well in times where a number of European countries have faced major challenges. The main reason for this is that Norwegian companies and workers have been quick to adapt to a rapidly changing world, while they themselves have helped to create change (www.regjeringen.no). Norway has shown a remarkable strength during the last years, and has been able to strengthen their position as a maritime nation in the wake of the financial crisis. Norwegian shipping has perhaps never been stronger than it is today. Overall, Norwegian shipowners expect growth of 6 percent and a total turnover of 265 billion in 2014 (Konjunkturrapport, 2014).

Norway is an advocate for global regulation of the industry. Through international organizations Norway contribute to secure market access for the Norwegian industry, and policy making regulating requirements for maritime safety, environmental and social standards (Stø Kurs 2020, 2013).

Norway has been represented in the IMO Council since the organizations inception in 1948. Norwegian authorities cooperate closely with the European Commission, the European maritime agency, European Maritime Safety Agency (EMSA) and EU member states. Through this cooperation Norway ensures that European regulation is developed in line with standards set forth by the IMO (Stø Kurs 2020, 2013).

3.3 What is the Arctic?

The Arctic Ocean is different from all the other oceans on the Earth, and because of its climate, the special location and the lands that surround it is unique. Most commonly The Arctic is defined as the region above the Arctic Circle. One thing that is really special with the Arctic region is that The Arctic Circle marks the latitude above which the sun does not set on the summer solstice (Solstice is the point in time when the vertical rays of the sun are striking either the tropic of cancer or the
tropic of Capricorn), and does not rise on the winter solstice. The special thing about the North Pole is that the sun rises only once each year and sets once each year. That means that it is six months permanent daylight and six months of permanent night (www.nsidc.org).

Figure 5: Definition of the Arctic

Due to the Earth’s tilt, The Arctic region’s climate is very cold and harsh for most of the year, and because of the Earth’s tilt the region never receive direct sunlight. In the winter, the region has 24 hours of darkness because the latitude is turned away from the sun the whole time of this part of the year, and by contrast in the summer, the region is receiving 24 hours of sunlight. But as mentioned, since the area never gets direct sunlight, the summers are also cold in most parts of the Arctic region (www.geography.about.com).

3.4 Who owns The Arctic Ocean and which countries surround it?

There are five countries that claims “ownership” of The Arctic Ocean (mainly because of their Arctic coastline), and these countries are; The United States, Canada, Denmark (which owns Greenland), Russia and Norway. The American interests in the Arctic region include: Limiting
Russian economic and military expansion into the area, trying to make the Northwest Passage to be classified as international waters, and working for an agreement with Canada on the Alaska-Yukon sea boarder. Canada’s interests in The Arctic Region, which geographically allows for a potentially large claim on the Arctic region, are not restricted to resource rights. Since the ice in the Northwest Passage are melting, they see the potential for an opening of new international trading routes that will shorten the shipping distance between Europe and Asia with approximately 2,150 nautical miles.

Denmark, along with Russia, is claiming parts of the North Pole itself via the Lomonosov Ridge (a 1,800 km long ridge, which divides the Arctic Ocean into two major basins: The Eurasia Basin and the Amerasia Basin). The Danish argues that the ridge is an extension of the Greenland landmass, Denmark is also claiming to certain islands in the Arctic region west of Greenland that are also claimed by Canada (www.geopoliticalmonitor.com).

For Norway, the claim has been dominated by a dispute with the Russian government. The two countries are arguing on how to define their mutual border in the Barents Sea area (175,000 square kilometers). (www.geopoliticalmonitor.com). In September 2010 the two governments signed an agreement on where the border should be drawn. The area of dispute is half the size of Germany and lies to the north off the two countries’ coastline. The treaty went into force on July 7, 2011 (www.eu-arctic-forum.org). The map bellow illustrates Norway’s preferred maritime border, Russian preferred maritime border, the disputed area and the agreed border.

Figure 6: Russia and Norway’s maritime border agreement
3.5 Arctic climate change and the effect on the shipping industry.

As we have mentioned earlier the Arctic is warming faster than anywhere else on the planet, but have this really affect the global shipping industry? Many scientists around the world forecast an ice-free summer in the Arctic within decades, opening the region up for commercialization, including energy production and shipping. The United States (Alaska), Canada, Russia, Denmark (Greenland) and Norway have huge interest in the Arctic. This is because these countries ring the Arctic Circle, and the region has major strategic significance (www.geopoliticalmonitor.com).

As the ice in the Arctic melts, new transport routes are opening. This is something many trading nations hope could rival, or at least complement, the routes that are used during summer months today. The Northern Sea Route (NSR) is the route that is gaining most traction as a seasonal alternative route, and the main focus of this thesis. This route will save a voyage from Yokohama to Rotterdam with approximately 40 percent, compared to a similar trip via the Suez Canal (www.cfr.org). As a result many nations will be affected by the developments in the Arctic, and not only the nations directly involved in the arctic, because the region’s shipping, fishing, energy and mineral production, scientific research, and other activities affects national economic welfare and security. For example the use of the NSR could result in higher export/import activities in Asian countries such as China and South Korea.
In 2010, only four cargo vessels sailed the whole route, but naturally as the ice kept melting this number has increased each year. Thirty-four sailed in 2011, forty-six in 2012 and seventy-one in 2013, and the numbers are expected to keep rising (www.cfr.org).

One of the other routes that is located in the Arctic Region is *The Northwest Passage*. This route connects the Atlantic and The Pacific Oceans through the Canadian Arctic. The route between Rotterdam and San Francisco is 7,000 km shorter or 12 days than the current route, which goes through the Panama Canal. The Canadians are claiming the area, which means that they could able to regulate fishing and set of laws on smuggling, shipping and the environment, but the US disputes the Canadian’s claim and they consider the passage as an international strait. Canada has submitted their case to the UN, but until the case is solved, the uncertainty over sovereignty of the passage continues (www.discoveringtheartic.org.uk).

The third and last shipping route in the Arctic area is the passage through the central Arctic Ocean, also called the *Transpolar Sea Route*. This route is highly dependent on a significant reduction of ice thickness. Scientific research suggests that vessels with ice breaking capabilities could be able to navigate through the central Arctic waters before 2020 (www.portlets.arcticportal.org).
3.6 Port facilities and infrastructure

For the ports being developed in the Arctic Region the situation is quite different compared to the rest of the world. Deep-water ports, places of shelter, marine salvage, adequate port reception facilities for ship-generated waste and towing services are rarely available (www.arctis-search.com). The lack of port infrastructure and support directly influences the level of risk associated with transiting through the Arctic Region.

Deep-water ports located near the area of the Bering Strait are few. The closest to the U.S. harbor is the Dutch Harbor and the closest on the Russian side is Provideniya. But if we take a closer look at the region between the Atlantic and Artic oceans, we can see that there are many deep-water ports—Norwegian, Icelandic and Russian.

All the orange circles in the map bellow illustrates where the different deep-water ports are located in the region. As we can see, there are no ports located northeast of the bearing sea, which is where the NSR is.

Figure 8: Important Arctic ports

www.athropolis.com
The way the infrastructure is build up in the region will make emergency response very challenging, the great distance and remoteness, weather, cold, ice and difficult operating environment and the lack of infrastructure on the shore side is some of the challenges (www.arctis-search.com)

### 3.7 Different types of Arctic activities

In this paper the focus will be on the activities relating to the possibility of using the Northern Sea Route as a new cargo transit corridor between Europe and Asia. Other new opportunities that will emerge are the recovering of oil and gas in the Arctic Region and tourism in the region. Many experts believe that it is a considerable potential to find oil and natural gas in the Arctic. Some say that nearly one-quarter of the earth’s undiscovered, recoverable petroleum resources lie in the region, 13 percent of the oil, 30, percent of the natural gas and 20 percent of the liquefied natural gas (www.cfr.org). Earlier, enormous parts of the Arctic region were unexplored. But this is now changing. Higher oil prices, better technology, more opportunities, and melting ice is some of the factors that have affected the industry to look up towards the north. The energy investments in the Arctic will be dependent upon a number of factors such as; global commodity prices, exploration and production technologies, geographic access and infrastructure (www.cfr.org).

Further the Arctic region attracts people from all over the globe, with the ice melting and less barriers to entry it could allow tourist to experience the regions fantastic wildlife, pristine landscapes and local cultures in a way that have never been done before. The most difficult barriers threatening tourism in the Arctic region has been access difficulties, environmental conditions, cost of travel, time to travel and jurisdictional restraints (www.grida.no).

### 3.8 New regulations and The Polar Code

The Arctic has become a region of considerable importance for the shipping industry. Hence, several concerns related to the laws of the sea have emerged. The goal forward is to apply the global law of the sea in the specific context of the Arctic region. If an oil tanker has an accident in the Arctic Ocean, it could have serious environmental consequences. Furthermore, the operational
impacts of shipping should also be included. Especially when ships de-ballast, they expose the Arctic environment for species that are unfamiliar and possibly devastating for the region (www.imo.org).

Today, shipping companies operating in Polar Regions are affected by four main regulatory frameworks. These are: SOLAS, MARPOL, UNCLOS and STCW. SOLAS is a safety requirement, which affects all ships that are subject to the convention and operating in Polar Regions. MARPOL provides the mandatory amount of environmental protection with zero discharge requirements for Antarctica. UNCLOS is a legal framework, which is governing the rights and responsibilities of nations in their use of ocean space. And last STCW involves guidance and recommendations for training and competency of officers and masters on ships in Polar regions (www.imo.org).

The International Maritime Organization (IMO), which is the United Nations specialized agency whose main responsibility is the safety and security of shipping and the prevention of marine pollution by ships, established in 2002 a “guideline for ships operating in Arctic ice-covered waters”. These guidelines were adopted to respond to the concerns described earlier, and are just recommendatory (Jensen, 2008).

As trends and forecast predicts and indicates that polar shipping will experience a huge growth in volume and a diversification in nature in the future, the challenges related to this growth needs to be managed, without comprising the safety or life at sea or the sustainability of the polar environment. The risks associated with operating in the Arctic are unique. Poor weather conditions, lack of good charts, communication systems and other navigational support poses challenges for operators.

Due to the remoteness of the area, rescue or clean ups are very difficult and most certainly costly. The low temperatures in the area could decrease the effectiveness of important components of the ships and when ice is present can damage the ships, propulsion and appendages. Therefore, IMO started the process of developing a better and more applicable mandatory International Code of safety for ships operating in polar water. The International Code is called the “Polar Code”, and covers the full range of design, construction, equipment, operational, training, search and rescue and environmental protection that are highly relevant for the ships that are going to operate in the inhospitable areas around the two poles (www.imo.org). The Polar Code is still yet to be finished
due to the challenging task of making the code a mandatory supplement to the other four main legal frameworks, and not a substitution to them. The Polar Code has to be in accordance with the old frameworks and it has to be adaptable to them. IMO are hoping to complete the Polar Code during 2015 (www.ics-shipping.org).
4. Theoretical Framework

In order to analyze the research questions and the data collected it is necessary to present and discuss some theoretical tools that we will use in our thesis. The theoretical framework was used to guide the development of the questionnaire and the interview. Furthermore the theoretical framework will enable us to analyze the results of this study, and subsequently draw conclusions.

To be able to analyse the viability of the Northern Sea Route, and how the Norwegian shipping industry best can position itself to take advantage of the potential opportunities this will offer, we need to analyse the shipping companies current position in the industry. For this purpose a theoretical framework consisting of cluster theory, Michael Porter’s Diamond of National Advantage, and theories explaining the importance of resources, capabilities and knowledge will be presented.

A section on industry change is also included. As global warming is causing Artic sea ice to melt and previously ice-covered seas are opening up for commercial navigation, the international shipping industry is exposed to changing circumstances. Therefore, a theoretical section on change is included. This will further be used to analyze the nature of the change, and whether or not Norwegian shipping companies are faced with a “game-changing” alteration of the industry.

Sailing along the NSR, and in Arctic oceans in general, is commonly perceived to involve relatively high levels of risk. In the subsequent section we move on to a theoretical framework that will enable us to analyze the level of risks, the sources of risk and potential measures that can be taken to manage risk.

4.1 Clusters

The inception of cluster theory can be traced all the way back to 1920. The very foundation of cluster theory can be found in Alfred Marshalls book “Principles of Economics” from 1920, where he introduced the concept of industrial district, he studied the localization of companies, and highlighted the importance of shared competence market, specialized suppliers and knowledge
diffusion (Marshall, 1920). Today the notion of cluster is more used than industrial district, and Michael E. Porter defines clusters as a geographical concentration of interconnected companies and institutions in a particular field. A cluster contains different linked industries and other entities that are important for competition. Suppliers of components, machinery and services, and providers of specialized infrastructure are all supporting and related industries that can be included in a cluster (Porter, 1998). Romanelli and Khessina (2005) further defines the interrelatedness in clusters as; “the extent to which industry clusters rely on overlapping resources (e.g., scientific knowledge, production experience, labor pools, and venture capital)”.

Some clusters also contains governmental institutions, universities, standard-setting agencies, think tanks, vocational training providers, and trade associations that provide training, information, research, education and technical support (Porter, 1998).

The source of a company’s productivity and competitive advantage can actually lie outside the firm and be rooted in a location and industry cluster. Clusters reduce transaction costs and boost efficiency and productivity. Additionally, clusters improve incentives and create collective assets in the form of information, specialized institutions, and reputation, among others (Porter, 2011). Maritime clusters, for instance, might gain access to favorable financing and insurance agreements as a result of a positive reputation of the cluster, contributing to competitive advantages for the companies and organizations in the cluster. A positive reputation can also lead to increased demand for the services provided by the members of the cluster. Moreover, clusters enable innovation and speed productivity growth.

Cluster development allows for geographic, cultural, and institutional nearness, which gives the companies in the area special access, closer relationships, better information, and other advantages that normally are very difficult to get from a distance. Clusters affect the competition in the area by increasing the productivity of companies in that area and clusters drive the direction and pace of innovation. Local assets, such as knowledge, relationships and motivation, provide a competitive edge that distant rivals have difficulties to copy (Porter, 1998).

Clusters can also be understood in relation to regions. Regions can be seen as complex social entities, surrounding different types of social and business activities and exists within several levels of geographic locations. Regions can exist on levels such as cities, counties, states or nations. Regions are often understood in relations to their cultural, political and industrial characteristics.
Industries or industrial clusters, inform the internal and external audiences about the kind of organizations that are likely to succeed in a region. Romanelli and Khessina (2005:346) explains that “clusters are a salient feature of a region’s industrial face, both because they generate significant amounts of the economic wealth of a region and because they are the most easily perceived feature of regional industrial activity by external audiences”.

Clusters vary in their sizes and relationships, which naturally affects the ability to capture attention. Romanelli and Khassina (2005) suggest that there are two dimensions of regional cluster configurations; cluster dominance and cluster interrelatedness. The figure below illustrates four regional cluster configurations that form the basis of their suggestions.

**Figure 9: Landscape of regional cluster configuration**

Type I shows a region with a high dominant cluster, with none or low relation to other clusters in the region. Type II illustrates a region with a high dominant cluster, but also with a high interrelatedness with other smaller clusters in the region (Silicon Valley). Type III shows several non-dominant clusters that are unrelated to each other. And last we have type IV, which illustrates a region with multiple non-dominating clusters, which is highly related to each other. Type I and
Type II shows a close relation between a cluster identity and a regional industrial identity. Here, a single cluster dominates the activity in the region. For external audience, this makes a unified industrial face. A single-cluster-dominated region can and will attract skilled people from around the world, and helps the region to attract more resources. (Romanelli and Khessina, 2005).

4.2 Porter’s Diamond of National Advantage.

National competitiveness has been a subject of discussion, debate and much has been written about it. However, while the idea of a competitive company is clear, the idea of a competitive nation is not as clearly defined. According to Porter (1990:76) “The only meaningful concept of competitiveness at national level is productivity”.

In an age of rising cluster development, and nation’s constant pursuit of competitiveness and prosperity, the role of government has changed, and the old distinction between *laissez-faire* and intervention has become obsolete. According to Porter (2011), now governments should first and foremost strive to create an environment that supports rising productivity. In some areas, like trade barriers and pricing, this implies a minimalist government role, while in areas like ensuring vigorous competition, providing high quality education and training, governments should take a more active role. The government’s role can also been seen in relation to Porter’s diamond, which will be discussed later in this section, because the government can influence all parts of it. Moreover, there is a mutual dependency between government and business in national productivity. To remove obstacles, lower unnecessary costs, and create appropriate inputs, information and infrastructure, there needs to be an ongoing dialogue between government and business. Challenges related to cooperation and the counterproductive tension between private and public sector that can arise due to different logics and way of thought needs to be minimized (Porter, 2011).

According to Porter (2011) wealth is governed by productivity, and the root of productivity is found in the national and regional environment for competition. Porter’s diamond of national advantage addresses the information, incentives, competitive pressures, and access to supporting firms, institutions, infrastructure, and pools of knowledge and skill in a location that support productivity and productive growth in particular fields (Porter, 2011).
Porter’s diamond theory includes and offers a positive and constructive role for practically all of a nation’s institutions in competitiveness, including educational institutions, standard-setting agencies, consumer societies, professional societies, and the juridical system. All these institutions have a role in creating conditions for higher productivity (Porter, 2011).

Porter’s Diamond of National Advantage is based on four broad attributes of a nation; *Factor Conditions*, *Demand Conditions*, *Related and supporting Industries* and *Firm Strategy, Structure, and Rivalry*. These attributes, both individually and as a system, constitute the diamond of national advantage. These four attributes create the national environment, and teach the actors in the industry how to compete (Porter, 1990).

![Figure 10: Porter’s Diamond of National Competitive Advantage](image)

The first attribute is what Porter refers to as *Factor Conditions*. This is the nation’s position in factors of production, such as competent labor, material resources, knowledge resources, capital resources or infrastructure. These factors are necessary and very important for a country to compete in a certain industry. Porter states that in sophisticated industries, a nation does not get, but instead
creates the most important factors of production. Additionally, the amount of factors that a nation has at a particular time is not as important as the rate and efficiency with which the nation creates, upgrades, and deploys them in a particular industry. A nation’s factor conditions have different levels of importance, not all factor conditions hold the potential to be the bases of competitive advantage. For a factor to support competitive advantage it must be highly specialized to an industry’s specific needs. Furthermore, the presence of world-class institutions, which create and continually upgrade specialized factors, can result in competitive advantage (Porter, 1990).

Secondly, there are Demand Conditions. Porter (1990) describes this as the nature of home-market demand for the specific product or service. Nations gain competitive advantage in industries where the home demand provides their companies with a clear or early picture of emerging buyer requirements, and where demanding buyers push for faster innovation. Porter further states that if the nation’s domestic buyers are the world’s most sophisticated and demanding buyers, the nation’s companies will gain competitive advantage. Sophisticated buyers force and pressure companies to meet demanding needs, meet high standards, to innovate and upgrade. The characteristics of home demand are far more important than the size of the demand.

Furthermore, home-market buyers can help a nation’s companies gain advantage if their needs and requirements provide “early-warning signals” of global market trends. If a nation is exporting its values and tastes as well as its products, a nation’s companies can anticipate global trends. An example of this is the America’s taste for fast food, which has spread to the rest of the world, resulting in international success for U.S. companies (Porter, 1990).

The third attribute is Related and Supporting Industries. This means that it is necessary for a nation to have supplier industries and other related industries that are internationally competitive to achieve national competitive advantage. Porter (1990) explains that internationally competitive home-based suppliers create advantages in downstream industries. A nation with internationally competitive home-based suppliers is based on close working relationships. Suppliers and end-users have a short line of communication, and an ongoing exchange of ideas and innovations, which positively affect the level of innovation and upgrading.
Last, we have *Firm Strategy, Structure, and Rivalry*, which are the circumstances and context in the nation influencing how the companies are created, organized, and managed, as well as the nature of domestic rivalry. Companies differ in the goals that they want to achieve. The goals reflect the characteristics of national capital markets and the compensation practices for managers. In addition, individual motivation to work and further develop skills is also important for competitive advantage. Exceptional talent is a scarce resource in any nation. The type of education talented people choose, where they choose to work, and their effort and commitments highly influences a nation’s success. Porter further explains: “*The goals a nation’s institutions and values set for individuals and companies, and the prestige it attaches to certain industries, guide the flow of capital and human resources – which, in turn, directly affects the competitive performance of certain industries*” (Porter, 1990:84). Nations are often competitive in industries or activities that people admire or depend upon.

Local rivalry is also a powerful factor to the creation and persistence of national competitive advantage. Additionally, geographic concentration magnifies the power of domestic rivalry; the more localized the rivalry, the more intense, and the more intense, the better. In an environment with a high level of competition, the companies in the industry strive to be the best. For the shipping industry for instance, this means being the most reliable, cost effective, and fastest. Among all the attributes in the diamond, domestic rivalry is the most important. This is because this attribute has powerful stimulating effect on all the other attributes. Home-market rivalry creates pressure on companies to innovate and improve, and for constant upgrading the source of competitive advantage (Porter, 1990).

The four attributes, each defines a point in the diamond of national advantage, and the state of one attribute is often dependent on the state of the other attributes. Weakness in any one determinant will constrain the industry’s potential for advancement and upgrading. However, the attributes in the diamond are also self-reinforcing. Moreover, the points in the diamond create a system, a system which facilitates an environment that promotes clusters of competitive industries. Once a cluster has formed, it becomes a vehicle for maintaining diversity and overcoming inertia, inward focus, inflexibility, and accommodation among rivals that block or slows down competitive upgrading and new entry.
4.3 Resources, Dynamic Capabilities and Knowledge

For Norwegian shipping companies to be able to take advantage of new opportunities i.e. the Northern Sea Route, and gain competitive advantage, they need the right resources. Moreover, companies need to be equipped to handle a changing environment, which requires a firm to be able to modify and extend its resource base, and knowledge base. In the following section the Resource Based View, Dynamic Capabilities and the Knowledge Based View will be presented and explained.

4.3.1 The Resource Based View

The Recourse Based View (RBV) is a result of a shift in focus of strategy thinking toward firms’ internal environment. Emphasis on resources and capabilities rather than industry attractiveness is seen as the denominator for firm success (Grant, 2010). Following the traditional RBV it is the possession of resources and capabilities that will produce long-term competitive advantage. Furthermore, advocates for the RBV aims to explain differences in firm performance within industries, thus RBV can be understood as a compliment, rather than replacement, for the Porterian view (Kraaijenbrink, Spender, Groen, 2010).

The main belief in the RBV is that a firm’s sustainable competitive advantage can be achieved through their tangible, intangible and human resources. The RBV explicitly looks for internal sources of sustainable competitive advantages (Peteraf & Barney, 2003). The resource-based view also claims that if one party already holds a given resource, it affects the costs of getting these resources for late acquires (Wernerfelt, 1984). This means that a firm can use important and attractive resources as barriers to enter the industry.

Barney (1995) suggests the VRIO framework for analysing the competitive implications of a firms internal strengths and weaknesses. This encompasses valuable, rareness, imitability, and organisation. For a firm to define their resources and capabilities to be valuable, the resources and capabilities must enable the firm to exploit opportunities and/or neutralize threats in the environment. These attributes should constantly be evaluated to see whether they continue to add value despite environmental changes. Furthermore, if a competing firm possesses the same valuable resources and capabilities, they are not rare and cannot be the bases of competitive advantage on
their own. Imitability is also an important factor in the RBV framework. As mentioned earlier, if a competing firm does not possess a resource or capability, they will face a cost disadvantage in obtaining it. It is also important for the firm to be organized to fully exploit the potential of its resources and capabilities. In isolation, this has little effect on generating competitive advantage, but together with the VRI resources and capabilities, it increases the firm’s potential to achieve competitive advantage (Peteraf & Barney, 2003).

4.3.2 Dynamic Capabilities
The VRIO framework is adequate for analyzing in fairly static environments. The limitation to the applicability of the framework arises when the competitive landscape changes. Barney indicates that the RBV has limited applicability, it only holds as long as the industry’s “rules of the game” stay relatively fixed (Barney, 2002 in Kraaijenbrink, Spender, Groen, 2010).

The aforementioned suggest that sustainable competitive advantage requires more than the possession of VRIO resources and capabilities. It also requires unique dynamic capabilities (Helfat & Peteraf, 2009). The notion of dynamic capabilities is rooted in the RBV, and began as an approach to understand strategic change (Teece, Pisano, Shuen, 1997). Grant (2010), argues that dynamic capabilities are processes through which the firm changes through exploration activities, and that these activities build the company’s stock of knowledge that includes knowledge creation and knowledge acquisition. What is unique about this concept is that it addresses how companies can sustain a capability-based advantage in the context of environmental change (Helfat & Peteraf, 2009).

Helfat et. al (2007:4) define dynamic capabilities as “the capacity of an organization to purposefully create, extend or modify its resource base”. Furthermore, Teece (2007) argue that dynamic capabilities are what enable firms to “create, deploy and protect the intangible assets that support superior long-run business performance”. The firm’s processes that use resources—specifically the processes to integrate, reconfigure, gain and release resources—to match and even create market change. Dynamic capabilities thus are the organizational and strategic routines, by which firms achieve new resource configurations as markets emerge, collide, split, evolve, and die (Eisenhardt & Martin, 2000: 1107). The increasing dynamism of the environment with rapid changes has led researchers (e.g. Eisenhardt, 1989), to question the sustainability of superior
performance of companies through any given position, resources, or set of moves (Eisenhardt & Santos, 2002).

4.3.3 Knowledge Based View

Closely related to the Resource Based View, and the notion of dynamic capabilities in particular, is the Knowledge Based View (KBV). The KBV, like the RBV, also contribute firm success and competitive advantage to internal resources in the firm. While the RBV is concerned with all types of resources, both tangible and intangible, the KBV is concerned with generating value from knowledge (Grant, 2010). Argote and Ingram (2002) argue that the creation and transfer of knowledge form the basis for a company’s competitive advantage.

Capability development can be realized through four different approaches; mergers and acquisitions, internal development, incubating in separate organizational units, or knowledge management. Furthermore, the management of capabilities and resources can be referred to as knowledge management, which is a term that captures a range of organizational processes and practices that all focus on generating value from knowledge (Grant, 2010).

According to Nonaka and Takeuchi (1995), knowledge is modeled as an unambiguous, reducible and easily transferable construct. Knowledge can be viewed as both tacit and explicit. Tacit knowledge is linked to the individual, and is hard to articulate – one has to learn through observation and doing. Explicit knowledge, in contrast, can be codified, which means that one can learn this type of knowledge through messages that can be processed (Polanyi, 1967; Grant, 2010).

Eisenhardt and Santos (2002), mentions two distinct terms that lays the foundation for the KBV: Organizational Learning and Dynamic Capabilities. The notion of dynamic capabilities was mentioned and presented in the section above, thus the focus will be on organizational learning in this section.

Organizational learning can be seen as a foundation for the KBV, and learning can be defined as the process by which new information is incorporated into the behavior of agents, changing their patterns of behavior and possibly, but not always, leading to better outcomes (Eisenhardt & Santos, 2002). It is also argued that organizational routines form the basis of collective learning in organizations, as they are seen to be capabilities for repeated performance that have been learned by
an organization over time (Cohen et. al., 1996). However, this may lead to path dependence, which in some cases may cause more problems than solutions for the company (Cohen and Levinthal, 1990).

Cohen and Levinthal (1990) relate organizational learning and innovation to developing a knowledge base within the company. They define the ability to recognize the value of external information, and being able to integrate and apply it, as absorptive capacity. They argue that absorptive capacity is largely a function of the firms’ level of prior knowledge, and diversity of experience. In order to provide organizational learning, Brown and Duguid (1991) proposed a unified view of working, learning and innovation. They point out that codification of work procedures can be quite different from actual work practices, and that learning should be distanced from codified, transferable and objective notions of knowledge. Instead, they argue that one should focus on knowledge in context. By this, they mean that important knowledge is related to daily work, and acquisition of new knowledge is gathered from real working practices that is called “communities-of-practice”. Here, knowledge is shared freely through collaborations such as joint work or narration.

KBV is a conception of the firm as a gathering of knowledge assets, where the company uses these assets in order to create value. This can be done in different ways, however, knowledge sharing and replication is an important approach to utilize the resources, capabilities and knowledge that the company holds. This involves transfer of knowledge from one part, or person in the company, to be replicated by another part or person in the company (Grant, 1996).

Within the KBV, a stream of research (i.e. Grant, 1996; Cohen and Levinthal, 1990; Szulanski, 1996) address how knowledge transfer within an organization depends upon the characteristics of the knowledge, the sender, receiver – and their mutual relationship. Szulanski (1996) focused on four causes of problems related to knowledge transfer within a firm; characteristics of knowledge transferred, source of the knowledge, the receiver and the context of the transfer. He found three important barriers to knowledge transfer. These were lack of absorptive capacity of the receiver, causal ambiguity of the knowledge that was to be transferred, and difficulties in establishing personal interactions between the source and the receiver – and he concluded that knowledge variables, not lack of motivation, were primary barriers to knowledge transfer.
Reagans and McEvily (2003) examines what network mechanisms that influence the transfer of knowledge. They identify two important dimensions; social cohesion and network range and conclude that both dimensions ease knowledge transfer. They explain that cohesion around a relationship can ease knowledge transfer and stresses the value of overlapping ties between third parties. Dense third-party ties may help in overcoming obstacles in relation to knowledge transfer. Network range can also affect the transfer process, and is explained as relationships that span multiple knowledge pools. Furthermore, network range specifies the benefits associated with network connections that span organizational boundaries.

4.4 Industry Change

While the Resource Based View assume that environments are fairly stable (Farjoun, 2007), more recent theory in the strategy field, however, argue that the environment, and thereby how to do business, is changing rapidly (Farjoun, 2007, Bettis and Hitt, 1995). Leonard-Barton (1992) further claims that core capabilities can become disabilities when faced with change. Farjoun (2007) question whether traditional business strategy is still relevant in a dynamic and ever-changing environment.

Unpredictable industries and discontinuous change challenges the persistence and value of existing industry structures, strategies, resource commitment, advantages and mind-sets. Furthermore, when environments change quickly, companies may find it challenging to adjust, develop and deploy their resources before it is too late. In light of this, the notion of sustainable superior performance and sustainable competitive advantage becomes remote (Farjoun, 2007). In industries characterised by perpetual change Farjoun (2007) argues that there are no stable performances, and advantages are only temporary.

Hamel (2002) claims that the key for companies to handle change is not to adapt to external change, but rather create the future. Companies that adapt to change are doomed to playing catch-up; competitive advantages accrue to companies that lead and initiate change. Courtney (2002) shares this view and argues that in fast changing, uncertain and turbulent environments firms should try to shape their environments rather than adapt to them. He further explains that companies, on some level, have the option to drive the market or industry towards one’s desired outcome. He also
recognizes that there are a number of influential aspects when initiating strategic change, like for instance timing, and whether to focus narrowly or to increase diversification.

Companies often face industry and environmental changes that seem to come out of nowhere. The inability to predict does not mean that it is not useful to think about what might happen in the future. Day and Schoemaker (2005) examine how companies can anticipate change sooner and how they can capitalize on them. They further explain; “The biggest dangers to a company are the once you don’t see coming. Understanding these threats – and anticipating opportunities – requires strong peripheral vision” (Day and Schoemaker, 2005:1). They developed what is referred to as a “strategic eye exam”, which is a diagnostic tool for evaluating and sharpening firm’s peripheral vision.

Companies operating in complex and rapidly changing environment need a strong peripheral vision. On the other hand, a company that operates in more stable environments has less need for it. Companies should define the scope of their need, and then determine how to scan within this field, and it all starts with asking the right questions. Day and Schoemaker (2005) propose that open-ended questions can help a company in scanning its environment, and the questions should be directed at the past, present and envisioning futures. They conclude that companies with strong peripheral vision can gain remarkable advantage over industry rivals.

4.4 Risk

People often confuse risk with uncertainty. In 1921, Frank Knight defined the difference between risk and uncertainty like this: “Uncertainty must be taken in a sense radically distinct from the familiar notion of Risk, from which it has never been properly separated. The essential fact is that risk means in some cases a quantity susceptible of measurement, while at other times it is something distinctly not of this character; and there are far-reaching and crucial differences in the bearing of the phenomena depending on which of the two is really present and operating. It will appear that a measurable uncertainty, or risk proper, as we shall use the term, is so far different from an un-measurable one that it is not in effect an uncertainty at all.” In other words, Knight defined quantifiable uncertainties as risks. Holton (2004) further wrote that there are two ingredients that need to be present for a risk to exist. The first is uncertainty about the potential
outcomes, and second, the outcomes have to matter. For example, a person jumping out of a 100 m building faces no risk since he is certain to die.

Today the risk associated with operating in the shipping industry is well known. From a financial and economic point of view, the risk related to the production and sale of transport services, and the investment in the ships necessary to produce these services are the two most important risks. Harlaftis, Tenold & Valdaliso (2012) presents a framework, which on the left side, represent the supply side, and on the right side, the demand side is represented. The supply side is largely controlled by the shipowners, while the shipowner has little or none influence on the demand side.

Figure 11: The main business risk faced by shipowners


The main advantage with this framework presented by Harlaftis, Tenold & Valdaliso, (2012) is that it deals with the two most important factors for the health and sustainability of a shipping company, and it covers income versus costs, on the one hand, and net assets on the other, which is two significant parameters on a day to day basis.

4.4.1 Why companies should manage risk

There are numerous reasons why firms chose to manage risk, however, a lot of companies choose not to manage their risks, and the strategies differ a lot from one company to another. Christoffersen (2003), states that larger firms tend to manage risks more actively than smaller companies. A reason for this is because smaller firms have limited access to derivative markets and expertise on how to trade in these markets. You can find a several reasons why companies choose to manage risk, but not all of them are applicable to shipping companies. In this section we will identify four economical and financial motives for a shipping company to use risk-management strategies.
The first is the cost of bankruptcy. The direct and indirect costs of a bankruptcy could be enormous for a company operating in the shipping industry. The costs that are included in bankruptcy costs are administration costs, loss of customers, loss of key employees, and restrictions imposed on the operations and management of the company. Managers use risk management to reduce the variability of expected earnings, and it also reduces the probability of a bankruptcy, which can increase the overall value of the firm (Alizadeh & Nomikos, 2009).

Secondly, there is capital structure and the costs of capital. The inability of a company to service its debt is often a source of a company’s default. If a firm has a high debt-to-equity ratio, the firm is seen as risky. Risk management is therefore used to raise the debt-to-equity ratio so that the company can receive benefits from increased interest tax shields (Alizadeh & Nomikos, 2009).

Third, we have benefits for public listed companies. Risk management can reduce the variability of a company’s share price in relation to changes in the price of the underlying commodity. Companies engaging in risk management strategies also tend to outperform comparative companies that do not have any risk management strategy (Alizadeh & Nomikos, 2009).

Lastly we have taxes. By the help of risk management strategies, companies can reduce tax liability by reducing the volatility of expected earnings. Alizadeh & Nomikos (2009) argues that by reducing the volatility of future pre-tax income, it will lower the variability of the expected tax position, and further increase the expected after-tax income.

4.4.2 Risk related to shipping activities

There are several business-risks associated with shipping activities, and business-risk can be defined as the possible decline in the value of the company due to an event, or a change in other factors that affects its value (Alizadeh & Nomikos, 2009). According to Harrington and Niehaus (2003) business-risk can be classified in three different categories: price risk, credit risk and pure risk. In addition, a wide range of industries, including shipping, is subject to political risk, and this type of risk can affect an organization’s activity, objectives and profitability. In the following section these four categories of risk will be further explained.
Price risk
This category refers to the uncertainty over the level of cash flows, and the reason for this uncertainty is the possible changes in input and output prices that can occur in the shipping industry. Output price is the risk of changes in the price that you can demand for your goods and services. Input price we refer to as the risk of changes in the prices you must pay for raw materials, labor etc. (Alizadeh & Nomikos, 2009). Further we can identify the following sources of price risk for a shipping company: freight-rate risk, operating-costs risk, interest-rate risk and asset-price risk.

Freight rate is the amount of money paid to a shipowner or shipping line for the carriage of each unit of cargo between named ports (Stopford, 2009). This is often named as the most important risk factor for a shipping company. This is because the volatility in the freight market has a direct impact on the earnings and profitability of the firm. Operating-costs risk we refer to as the volatility on the costs side, and one of the most important costs factor for a company is the cost of fuel (bunkers). The costs of fuel oil accounts for more than 50% of the total costs, and as a result fluctuations in fuel prices have an enormous impact on the operating profitability (Alizadeh & Nomikos, 2009). Interest-rate risk refers to the risk associated with changes in interest rates. Since most of the acquisitions on vessels are financed through term loans priced on a floating rate basis, the change in interest rates can create cash flow and liquidity problems for the firm. Last we have asset-price risk, which is the risk associated with the fluctuations in the assets prices. For a shipowner, the major assets are the ships. A change in ship prices affects both the balance sheet value of the firm and the creditworthiness of the shipowner (Alizadeh & Nomikos, 2009).

Credit risk
Credit risk refers to the risk associated with the uncertainty of whether a counter-party to a transaction will perform its financial obligations in full and on time. Credit risk is also known as “counter-party risk”. This could be a failure to repaying a loan, or a failure to receive a payment for a service or product, which the company has provided (Alizadeh & Nomikos, 2009). A large share of trades, deals and contracts are negotiated directly between the counter-parties, which means that a lot of the agreement is based on trust and the beliefs that the agreement will be honored.
Pure risk
Alizadeh & Nomikos defines pure risk as the risk of reduction in the value of the firm due to physical damage, accidents and losses. It also covers the risk of loss due to physical risks, technical failure and human error in the operation of the assets of a company, as well as the risk of legal liability for damages as a result of actions of the company. Pure risk can include the risk of collision, accident or liability from oil or chemical spillage (Alizadeh & Nomikos, 2009).

Political risk
Accenture define political risks as “uncertainties to business objectives created by political actors or political conditions”. Governments, non-governmental organizations, state-owned enterprises, trade unions and other groups that pursue political objectives can all be exposed for political risks. There are several sources of political risk; bribery, capital controls, contract default, expropriation/nationalization, license cancellation, protests/strikes, regulatory change, taxation and war and terrorism (Beardshaw, Cattaneo & Gomes, 2012).

A wide range of industries are subject to political risk, and this type of risk can affect an organization’s activity, objectives and profitability. Managed correctly, however, political risk can be a source to competitive differentiation that enables firms to enter and navigate new business environments and markets. Managing these risk can help companies gain significant benefits. If managed effective, political risk can enable companies to tap new revenue streams through access to new markets and joint ventures.

4.4.3 Managing Risk
Regardless of the type of risk under consideration, a risk management process includes several key steps. Harrington and Niehaus (2003) identify the following four key steps: risk identification, risk evaluation, risk management, and risk monitoring. Additionally, Accenture propose a three-stage process for management of political risk; Identify, Measure and Manage (Beardshaw, Cattaneo & Gomes, 2012). In reviewing these two proposed risk management processes, it is clear that the key steps are identical, except the last step proposed by Harrington and Niehaus, risk monitoring, is not included in Accenture’s process. Alizadeh & Nomikos (2009) further elaborates on Harrington and Niehaus’ risk management process in direct relation to the shipping industry.
In the following a framework for risk management, building upon the key steps identified above is presented. The framework will include measures specifically useful for the shipping industry, in combination with elements relevant for dealing with political risk.

**Risk Identification**
The first step in the risk management process is identification of risk. In general this includes identification of exposure to potential loss. This can, for instance, be done by analyzing your company’s financial statements in order to identify which factors mostly affect the value of the company (Alizadeh & Nomikos, 2009). On the other hand, the main political risks are identified by geography and the key question is “how can political actors or conditions directly affect our objectives?” The management should construct different evidence-based set of risk scenarios, which gives the management the basis to define their data requirements. Once the firm has a broad political risk scenario set, management can prioritize those risks that are most vital for the company business (Beardshaw, Cattaneo & Gomes, 2012).

Regardless of the techniques used to identify risk, the step requires an overall understanding of the business and the certain economic, legal and regulatory factors that affect the business (Alizadeh & Nomikos, 2009).

**Risk Evaluation/Measure**
The second stage is to evaluate and measure the identified risks. This normally involves the quantification of the exposure of the company to the identified risks. The sensitivity to a given risk factor varies from company to company, and depends on the company’s operational strategy (Alizadeh & Nomikos, 2009). Furthermore, with help from the set of political risk scenarios developed in step one, the company can measure the impact of political risk on the business. Here they can for instance use a discounted cash flow analysis to estimate the financial impact of specific events, organizational network analysis can help the management to estimate operational impact of specific risks, and they can use an ERM (Enterprise Risk Management) diagnostic tool to estimate the organization’s current ability to manage risks (Beardshaw, Cattaneo & Gomes, 2012).
**Risk Management**
In this stage the risks have been identified and measured, and the next step is to select the appropriate instruments to manage the risks. A company should map potential risk management methods against the priority risks. Again, the appropriate instruments vary depending on the type of risk being managed. Price risks, for instance, can be managed using derivative contracts such as futures, options and swaps. On the other hand, pure risks are usually managed by using appropriately prepared insurance policies (Alizadeh & Nomikos, 2009). Some examples of risk management methods for political risks are; portfolio diversification, political risk insurance, asset/personnel security management, joint business ventures, lobbying and prominent alliances, community initiatives, and agile and resilient supply chain (Beardshaw, Cattaneo & Gomes, 2012).

**Risk Monitoring**
This final step involves monitoring the performance and suitability of the chosen risk management methods and strategies. This should be done on an ongoing basis since market dynamics change continuously. The company’s exposure to the different sources of risk may change accordingly (Alizadeh & Nomikos, 2009).
5. Short summery of questionnaire

In this section we will present a short summery of the results from the questionnaire. These results will further be used in the following analysis in this thesis. 50 Norwegian shipping companies were invited to participate in the survey, 32 companies responded and completed the survey in full, which gives a response rate of 64%. To complete the survey, all questions had to be answered, except question 1.

5.1 Background information

The first question in the questionnaire was “company name”. This question was not mandatory to answer. The question was voluntary as the participant could be unwilling to share information or give biased response if their company name was specified. It was important that the participant did not feel like they revealed too much of their strategic activities. 26 respondents chose to disclose their company name, whilst 6 respondents chose to remain anonymous. A complete list of company names can be found in appendix 3.

The second question was included to gain information on the size of the companies. This was done by asking how many vessels the company operated.

![Number of vessel operated by your company:](chart.png)
As can be seen in the table above, the majority of the participants answered that their company is operating between 11-20 vessels (31.25%) and between 1-10 vessels (28.13%). Furthermore, the table shows that 15.63% of the respondents are working in a company that operates more than 50 vessels.

The third question was which sector of activity the company operates in. Here the researchers provided the participant with multiple choices, and the participants were able to select one or more of the alternatives provided. A category for “other (please specify)” was also included. This gave the participant the opportunity to include other alternatives not given in the multiple choice.

<table>
<thead>
<tr>
<th>Sector of activity</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk</td>
<td>23.33%</td>
</tr>
<tr>
<td>Container</td>
<td>20.00%</td>
</tr>
<tr>
<td>General Cargo</td>
<td>11.67%</td>
</tr>
<tr>
<td>RoRo</td>
<td>11.67%</td>
</tr>
<tr>
<td>Special Project</td>
<td>8.33%</td>
</tr>
<tr>
<td>Tanker</td>
<td>6.67%</td>
</tr>
<tr>
<td>Other</td>
<td>23.33%</td>
</tr>
</tbody>
</table>

23.33% of the respondents in this question answered that their company’s sector of activity is Bulk, 20.00% answered Tanker and 11.67% answered that their sector of activity included container and special Projects. Furthermore, we can see that 18.33% of the participants answered “other”, which included specifications like LNG, Chemical, Open Hatch Vessels, Heavylift, Offshore Wind Construction, Gas Carriers and Car Carriers.
5.2 Level of knowledge

The two following questions were included to learn about the level of knowledge concerning Arctic shipping and The Northern Sea Route that exist in the industry.

In question four, the participants were asked to evaluate the following statement: “Our company has a high level of knowledge concerning shipping in the Arctic Region”. This question was asked because we wanted to gain insight on how the company’s knowledge is concerning shipping activities in the Arctic Region in general. Here, a five scale was used; strongly agree, agree, neither agree nor disagree, disagree and strongly disagree.

The table above shows that 6,25% strongly agree and 34,38% agree to the statement that their respective company has a high level of knowledge concerning shipping in the Arctic region. In the table below the respondents that answered strongly agree/agree and strongly disagree/disagree are summarized.
Now you can see more clearly that it is more people that answer that they strongly agree or agree that their company has a high level of knowledge concerning shipping in the Arctic Region (40.63%), than people answering that they strongly disagree or disagree in the statement (28.13%).

In the fifth question we wanted to ask the participant specifically about their company’s knowledge concerning the Northern Sea Route, therefore, in question five the participants was asked to evaluate the following statement using the same scale as in question four; “Our company has a high level of knowledge concerning The Northern Sea Route”. 
Again, we summarized the answers. Here you can see that the majority of the participant answered that they strongly disagree or disagree that their company has a high level of knowledge concerning The Northern Sea Route (43.75%) and only 21.88% of the respondents answered that they strongly agree or agree to the statement.

### 5.3 The Norwegian shipping industry’s opinions and intentions concerning The Northern Sea Route

In the next stage of the questionnaire we wanted to map the participant’s opinions and intentions about the potential of the Northern Sea Route as an alternative to the Suez Canal. The first question was formulated as follows: “Do you believe The Northern Sea Route holds the potential to become a viable option to the Suez Canal for shipping between Europe and Asia”. 
As can be seen from the table above, only 15.63% of the respondents answered that they do not think that The Northern Sea Route holds the potential to become a viable option to the Suez Canal for shipping between Europe and Asia. Further, if we summarize all the participants that answered that they believe The Northern Sea Route holds the potential to become a viable option to the Suez Canal for shipping between Europe and Asia, we can see that it is a share of 83.87% that believe that the route could be an viable option in the future.
The next question in the questionnaire was related to the company’s use of the Northern Sea route. The participants were asked whether their company has, to their knowledge, considering using The Northern Sea Route as an alternative route between Europe and Asia.

Only 25.00% of the 32 respondents answered yes, and 75.00% answered no. None of the participant answered that they did not know.

In question eight, the participants were asked what they considered as the main benefits for shipping via The Northern Sea Route. Here, an unstructured question was used, which means that we asked an open-ended question that allows the participants to answer the question in their own words. It enables the participants to express their general attitudes and opinions. A word cloud is presented to illustrate the participant most frequent answers.
What do you consider the main benefits for shipping via The Northern Sea Route?

The most frequent words in the word cloud are shorter, distance, time, saving, cost, consumption bunkers and fuel. Bellow some examples of answers are included:

- “The main benefits, as I see it, is saved costs and minimizing emission of various pollutant substances”
- “Shorter route, cost saving on bunker and operating cost, less emissions”
- “Cost and time saving. Less fuel consumption – Less environmental footprint. No piracy threat”

In the next question participant were asked the opposite, “what do you consider the main challenges/obstacles for shipping via The Northern Sea Route?” The same open-ended unstructured question was used and another word cloud was created.
What do you consider the main challenges/obstacles for shipping via The Northern Sea Route?

The word cloud clearly shows that the most cited words are *ice, weather, conditions, infrastructure, authorities, Russian, insurance, risk and uncertainty*. Examples of answer are:

- “Ice conditions, insurance, lack of infrastructure, political issues and Russian authorities”
- “Risk of ice, which in itself represents a danger and an obstacle depending on vessels ice class. Beyond that, the place is hardly habituated, meaning rescue in distress situations would be difficult and expensive. Hence, more risky than conventional alternatives”
- “Many: Ice conditions, weather, reliability on Russia for port, salvage, rescue etc. Shallow draft”

In question ten, the participant were asked to answer whether they think the Norwegian government and the Norwegian shipping industry should assume an active role in developing The Northern Sea Route for commercial navigation. Here a dichotomous question was used with only two alternatives supplemented with an “I don’t know” alternative. By formulating the question like this, it makes the coding and analyzing easier (Malhotra, Birks & Wills, 2012).
Here, 56.25% answered that they think the Norwegian government and the Norwegian shipping industry should assume an active role in developing The Northern Sea Route for commercial navigation, while only 15.63% answered No. Furthermore, the participants were invited to elaborate on their answer. Examples of such elaborations are:

- “It is a way of reducing emissions to the environment. In-order to have some kind of control of the shipping routes along the coast. It could increase the importance of the Norwegian industry due to Shorter delivery time from NWE to NEA than e.g. deliveries from South-Europe”
- “Commercial development will happen anyway to some extent, it will be better for Norway to actively participate and influence developments”
- “Beneficial for Norwegian trades and business development”
The last question in the questionnaire was: “Is your company considering the use of The Northern Sea Route in the future?” Here, the same answer alternatives were used as in the previous question.

40.63% of the participants answered that their company is considering using The Northern Sea Route in the future, while 34.38% answered No.
6. Analysis

Global warming is causing Artic sea ice to melt and previously ice-covered seas are now opening up for commercial navigation. Accordingly shipping companies all over the globe have started to consider the potential to find shorter sea routes between Europe and Asia.

6.1 PESTEL-Analysis of the Northern Sea Route

The concept of PESTEL analysis is used to track the environment companies are operating in or are planning to conduct new projects, products or services in. In other words PESTEL analysis is a framework that companies use to scan the organization’s, external macro environment. Going through this analysis helps you avoid actions that are likely to fail because of factors that are outside the company’s control. It can also help companies to spot opportunities that they can take advantage of, and manage potential threats. PESTEL is an acronym for six different macro environmental factors. These factors are: Political, Economic, Social-cultural, Technological, Environmental and Legal (www.oxlearn.com).

For the purpose of this thesis, the PESTEL framework will be used to analyze how macro environmental forces shape and influence the Northern Sea Route. To be able to best portrait the macro environmental factors that a Norwegian shipping company will face when choosing to navigate via the NSR, the PESTEL analysis will be conducted from the perspective of a Norwegian shipping company considering using the NSR for shipping between Europe and Asia.

6.1.1Political/Legal Factors

Political and legal macro environmental factors are two separate factors, and can influence the NRS in different ways. We have, however, chosen to analyze these two factors together. The political and legal factor’s effect on shipping and the NSR are so intertwined that it would be difficult to analyze them in isolation.

Any company is highly affected by the political and legal environment in which they operate, including shipping companies. Governments can influence everything from tax policies to level of involvement in trading agreements, which again can affect the revenue or the effectiveness of a
company. In addition, the level of governmental stability, regulation, and corruption level will influence the environment a company operates in. Moreover, legal factors can involve laws such as employment laws or international trade regulations and restrictions. The difference between legal and political factors is that legal factors are those, which have become laws and regulations and has to be complied with, while political factors means attitudes and approaches that are not mandatory (www.oxlearn.com).

**Infrastructure along the NSR**
The attractiveness of the NSR is highly dependent on Russian politics and governmental management. As an extensive part of the coastal line along the NSR is Russian territory, the infrastructure along the route will also be highly dependent on Russia. Russia has started the process of improving the infrastructure both to accommodate increased exports from the country and to accommodate for transit of ships along the NSR (“Økt skipsfart i Polhavet”, 2013). Over the next decade, ten new Russian navigational and emergency centers are expected to be installed to bring the new and increasing traffic under Russian supervision and regulation (www.businessinsider.com).

Whether the Arctic routes, including the NSR, will become economically viable in the coming decades has been subject of much debate. As substantial investments have to be made in the development and maintaining of the required infrastructure by the Russian federation, there are concerns regarding the level of costs this will impose on companies wishing to use the route. It is questionable whether the increased traffic alone will be sufficient to finance the investment in the magnitude needed to improve the infrastructure adequately. The question will consequently be how strongly Russian authorities wish to, and is able to pay for the initial investments, and the cost associated with operating and maintaining the NSR (Økt skipsfart I Polhavet, 2013)

**Political Tension**
Another factor to consider in relation to the political environment is the relationship between Norway and Russia. If there is tension between the two states, this could result in barriers that Norwegian shipping companies would have to overcome when planning to use the NSR. Historically the Norwegian and Russian bilateral relation dates back centuries, and has been characterized as good. Especially in the north, the economic, commercial and cultural relation has
been extensive. In 2013, approximately 100 Norwegian companies were represented in Russia. Norwegian companies within the maritime industry are highly represented.

In 2013, the High North region, and the relationship with Russia, was characterized by the Norwegian government as a stable political environment. A boundary agreement between Norway and Russia in the Barents Sea removed one of the main potential sources of conflict in the relationship between the countries, and was believed to further strengthen their future cooperation.

However, in light of recent political events between Russia and Ukraine, and rising political tension between Russia and the rest of the world, it can be questioned whether this is still the case. Despite huge international pressure, Russia has not shown willingness to stop its illegal actions in Ukraine. This has resulted in though economic sanctions imposed on Russia, by among others the EU and Norway. The enforcement of these sanctions has not been well received by Russia. Since Norway has participated in sanctioning Russia, Russia has answered by banning the import of several Norwegian products (www.nrk.no). These are hardly characteristics of a good and stable relationship between two nations. How this conflict evolves will have huge impact on the relationship between Norway and Russia, which again will affect Norwegian shipping companies wanting to sail the NSR. In the phone interview, Arild Moe, Deputy Director and Senior Research Fellow at Fridtjof Nansen Institute argue that all long-term investments in Russia is affected of the disturbances. Commercial actors see Russia as a highly risky, and it will stay that way even after the sanctions are waived. This will also indirectly influence any cooperation with Norway in the future.

Looking at the results from our survey, 56,25% of the companies that participated answered that they think the Norwegian government and the Norwegian shipping industry should assume an active role in developing the NSR for commercial navigation. Furthermore, Pierre Cariou, Associate Professor at Kedge Business School in Marseille, expressed in the interview, that he shares this view. He further stated that Norway is an obvious candidate to take a leading role in the future development of the NSR due to the country’s knowledge in sailing in extreme conditions. This would, however, require active cooperation, and a willingness by both Russia and Norway to work together toward common goals. For this to be possible the political tension, currently characterizing the relationship between the two nations, needs to be resolved.
However, the Norwegian government can still assume an active role concerning new regulations in the Arctic region (Polar Code) through the IMO. As one of the participants in the survey answered: “The NSR starts from Murmansk and it may be difficult for the Norwegian government to influence directly in the NSR. As far as we know this is controlled by the Russian administration. However, the Norwegian government and Norwegian shipping industry can have an active role when it comes to the Polar Code and shipping in the Arctic water. This is something that they are already involved in”.

**Corruption**
Each year Transparency International performs a survey where they score countries on how corrupt their public sectors are seen to be. The Corruption Perceptions Index serves as a reminder that the abuse of power, secret dealings and bribery continue to be present in countries around the world. The 2013 index scored 177 countries and territories on a scale from 0 (highly corrupt) to 100 (very clean). On this index we find Russia rather far down on the list, with a score no higher than 28 they are ranked as number 127. This indicates a fairly high level of corruption. In comparison, Norway is ranked 5th with a score of 86 points, indicating low corruption levels. The relatively high level of perceived corruption in the Russian public sector has been persistent over the years (www.cpi.transparency.org). Corruption has a strong effect on the political, social and economic life of a country where it takes place. Corruption can, among other, lead to inefficiency and weakened business development. When resources are tampered with and used improperly, the efficiency of business can suffer. In addition, corruption lowers investment and impedes economic growth (Mauro, 1995).

These are all factors that can have severe negative impact on the development of the infrastructure along the NSR. Also, it can pose challenges for a Norwegian company wishing to utilize the route as it can be difficult, and ethically questionable, to deal with establishments and other authorities that might be corrupt.

**Jurisdiction and Regulation**
As mentioned in the introduction of this paper, shipping companies operating in Polar Regions are affected by four main regulatory frameworks (SOLAS, MARPOL, UNCLOS and STCW). In addition, the IMO has provided guideline for ships operating in Arctic ice-covered waters, but these
are not mandatory. However, as traffic along the NSR and other Arctic areas is expected to increase rapidly, new regulations and more strict laws can be expected-

Today, Russia has most of the formal jurisdiction over the NSR. The United Nation gave the coastal state the right to adopt and enforce laws and environmental regulations in their exclusive economic zones where ice and climate can cause severe threats to navigation, and where pollution could cause major harm to the ecological balance (www.arctic-lio.com).

On March 15, 2013, the Russian Government established “The Federal State Institution, Administration of the Northern Sea Route” (www.arctic-lio.com). This was, in part, motivated by a perception of potentially hostile or competitive foreign threats to the Russian region (www.huffingtonpost.com). All vessels traveling through the NSR is dependent on a certificate from this institution to be allowed to navigate via the route. To receive this certificate the ship must be able to document that it fulfills all Russian demands. The administration of the NSR is the institution that obtains and considers all the submitted applications and gives the permission to navigate through The NSR (www.arctic-lio.com). This arrangement gives Russian authorities considerable power, power that can be abused. In august 2013 the NSR administration refused to issue transit authorization for Greenpeace vessel Arctic Sunrise, on the grounds that it was lacking the required ice classification (www.huffingtonpost.com). The vessel is classified by Det Norske Veritas as a “1A1” icebreaker, which was the second highest ice strengthening notation at the time of construction (www.dnv.com). According to Greenpeace the regulations were being manipulated by Russian authorities to prevent Greenpeace from protesting against Russian oil exploration in Arctic waters (www.businessinsider). This is a clear example of how Russian authorities can misuse their power.

This is also a concern expressed by the surveyed representations from the Norwegian shipping industry. Several of the companies answered that they view dealing with Russian authorities on several levels as highly uncertain and challenging. Furthermore, they question the reliability and credibility of Russian authorities, and their potential to use their powerful position to their advantage. On the question related to what the companies see as the main challenges and obstacles for shipping via the NSR the respondents answered i.e.: “Russian authorities”, “Political issues and Russian authorities”, “Political risk”, “Huge risk, Russian authorities”, “Russian authorities
on various levels”, and “Russians will overcharge for bunker, icebreakers and pilots and supplies taking down the benefits”. In addition, in relation to a separate question one participant also answered: “We fear that Russians will use this as a milk cow”. This indicates a highly negative perception of the Russian authorities, prevailing in the Norwegian shipping industry. Also Pierre Cariou agrees with the Norwegian shipping companies in that political issues are a major challenge in relation to sailing the NSR.

Moving on to the applicants that have received a certificate from the Administration of the NSR, they also have to pay a pre-determined fee to be allowed use of the route. This fee is called “The ice-breaker fee”. The fee covers the costs of using a mandatory icebreaker support. The icebreaker is used to make a path through the ice and ensure safe navigation though the NSR. This gives the NSR severe size restrictions, due to the rules that say that the vessel cannot be wider than the icebreaker. This implies that the vessel cannot have a beam wider than 30 m, which is equivalent to a vessel size of 50,000 dwt—much smaller than the vessels that are allowed through the Suez Canal (Lykke, 2008). To limit the costs, the ice-breaking fee tariff has an upper limit on how much the company has to pay for these mandatory services. In addition, the demands for icebreaker assistance will be dependent on the ice conditions. The Russians have reported that ships might be allowed to navigate through the route without ice-classification during the summer months. Since there are few bulk and container ships that currently satisfies today’s requirements for sailing through the NSR, this permission from the Russian government will decrease one of the barriers currently restricting the use of the route (KILD, Økt skipsfart). As of today (24.09.2014), The Northern Sea Route Administration has 618 applicants, of whom 15 are from a Norwegian flagged ship (www.nsra.ru).

*The Polar Code*

IMO started the process of developing a better and more applicable mandatory International Code of safety for ships operating in polar water, and Norway is actually leading this work to put in place binding global rules. The International Code is called the “Polar Code”, and covers the full range of design, construction, equipment, operational, training, search and rescue and environmental protection that are highly relevant for the ships that are going to operate in the demanding areas around the two poles (www.imo.org). It is important to ensure that the design and equipment is suitable for operations in Arctic waters, and that proper consideration for the environment is taken.
The Polar Code will also include specific demands concerning training of seafarers that are to operate in the Arctic (Stø Kurs 2020, 2013).

The Polar Code is still yet to be finished due to the challenging task of making the code a mandatory supplement to the other four main legal frameworks, and not a substitution to them. The Polar Code has to be in accordance with the old frameworks and it has to be adaptable to them (www.ics-shipping.org). This is in line with what some of the respondents expressed in the questionnaire: “Must be internationally approved and one set of rules for everyone” and “We need one set of rules and regulations”.

IMO is hoping to complete the Polar Code during 2015 (www.ics-shipping.org). The fact that the regulatory framework in the Polar Code is not completed yet means that shipping companies planning to sail the NSR must be prepared for changes in requirements and regulation in the coming years.

For ships to be allowed to travel through the NSR the ships must be designed, built and equipped to resist the challenges related to ice loads, Arctic weather and operating conditions. To ensure that ships are built to proper standard, The Polar Code will include an ice classification of ships called the Polar Class. It will include seven Polar Classes. The polar classes were also included in the voluntary guidelines presented by the IMO in 2002. The polar classes are as followed:

Table 1: Ice class classification

<table>
<thead>
<tr>
<th>Polar Class</th>
<th>General description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC 1</td>
<td>Year-round operation in all Polar waters</td>
</tr>
<tr>
<td>PC 2</td>
<td>Year-round operation in moderate multi-year ice conditions</td>
</tr>
<tr>
<td>PC 3</td>
<td>Year-round operation in second-year ice which may include multi-year ice inclusions.</td>
</tr>
<tr>
<td>PC 4</td>
<td>Year-round operation in thick first-year ice which may include old ice inclusions.</td>
</tr>
<tr>
<td>PC 5</td>
<td>Year-round operation in medium first-year ice which may include old ice inclusions.</td>
</tr>
<tr>
<td>PC 6</td>
<td>Summer/autumn operation in medium first-year ice which may include old ice inclusions</td>
</tr>
<tr>
<td>PC 7</td>
<td>Summer/autumn operation in thin first-year ice which may include old ice inclusions</td>
</tr>
</tbody>
</table>

http://www.imo.org
The lowest polar class (PC 7) involves a general level of strengthening of the ship, while ships classified as PC 1t, the highest Polar Class, is capable and equipped for independent operations without limitations (www.nsrp.org). The selection of class will depend on an analysis of ice statistics, owners experience, ice expertise and financial/economic considerations. The class selection will be a balance between ice conditions, operational requirements and costs (www.imo.org).

6.1.2 Economical Factors

Economic factors represent a wider perspective on the economy than money in the bank. Economic factors can include economic growth rates, levels of employment/unemployment, cost of raw materials such as bunker oil and steel, interest rates, exchange rates and inflation rates (www.oxlearn.com). All of which are highly relevant for the shipping industry.

World Economy and Trade

The economy forms the way consumers, suppliers and other organizational stakeholders behave within a society. If the economy is undergoing a recession the markets will experience high unemployment, low spending power amongst consumers and the confidence level of stakeholders will be low. On the other hand, if the economy is growing, we will experience low unemployment, high spending power amongst consumers and stakeholders would have a high confidence (www.learnmarketing.net).

Shipping is inherently a servant of the world economy, consequently changes in world trade will considerably impact the industry. Change in economic conditions at domestic or international level largely affects the shipping industry. As mentioned in the introduction, world population continues to grow, and alongside this growth emerging economies are likely to continue to increase the requirements for goods and raw materials. This development is expected to create more business for shipping companies (www.ics.shipping.org).

On the other hand, world economic growth has slowed down in recent years. In 2012 GDP increased 2.2 per cent, down from 2.8 per cent in 2011, which illustrates that world GDP is decelerating. In line with this development, growth in world merchandise trade also has slowed down. For the two past years, the growth in world trade averaged at a low 2.2 per cent. However,
WTO expects the growth rate in world trade to increase more rapidly in the coming years. The expected growth for 2014 is 4.7 per cent and 5.3 per cent for 2015. According to WTO Director-General Roberto Azevêdo, if GDP forecasts hold true we can expect an upturn in world trade in the years to come. He further states that by actively supporting trade growth by reaching new trade agreements and updating rules and regulation, one can accelerate this already ongoing growth (www.wto.org).

The economic factors described above, are more general for entire world shipping industry, and not specific to the NSR, but still very relevant. In the following we will focus on economic factors directly affecting the NSR.

**Investments and Interest Rates**

The shipping industry is a highly capital intensive industry. For a shipping company to be able to utilize the NSR it will require an upgrade of their fleet, which is a highly capital intensive procedure. Due to ice conditions and new requirements (Polar Code and the other regulations), vessels that operate in “normal” waters will not be allowed to sail the NSR. As mentioned earlier, there are strict requirements for a vessel to be allowed navigation in Arctic waters. Hence, new ships have to be ordered and built, which involves significant investments. There is also concern related to the year around usefulness of ships designed for Arctic navigation, and whether or not the investment will yield sufficient return. One respondent to the questionnaire expressed the company’s concern like this: “Having vessels with ice-class notations—higher steel weight—more expensive to build—higher consumption throughout the part of the year in which the vessels are NOT trading in icy waters”.

Prices on newbuildings are very volatile, and determined by supply and demand, where the shipping companies are the buyers and the shipyards are the sellers. When demand for new ships is high, so are the prices. This will imply that if the market for ice classed ships experiences a “boom” and many shipowners are competing for the few berths available, prices will rise sharply. However, the demand for new ships is dependent on the performance in the shipping industry at a given point in time. Since the industry is highly volatile, this means that it is quite difficult to predict how the price levels will evolve (Stopford, 2009).
When ordering new ships, a company needs funding. Capital can come from bank loans, the company’s own funds, or private investors, to name a few. Bank loans have been the most important source of ship financing for decades. The banks are able to provide borrowers with fast and flexible access to capital, while leaving the borrower with full ownership of the vessel (Stopford, 2009).

However, in the wake of the financial crises of 2008, traditional banks have over the past few years started to restrict their financing of the shipping industry. This has made it more difficult to acquire financing for newbuildings. The perceived safety of vessels as assets have weakened and lenders have grown cautious. Traditional financing may still be available in the future, but it will defiantly be subject to more stringent requirements and regulations (UNCTAD, 2013). For instance, the Basel III agreement will require new capital ratios for banks and is expected to be implemented gradually in the coming years up to 2019. One of the main outcomes of Basel III will be a significant rise in the banking industry’s capital requirements; this can potentially require more core equity capital by shipowners and raising the cost of capital for them (KPMG, 2012).

Furthermore, due to the capital intensive nature of the shipping industry, and the fact that most ship acquisitions are financed by term loans, which are priced on floating rate basis, unanticipated changes in interest rates may cause challenges and problems for shipping companies (Alizadeh and Nomikos, 2009).

**Bunker oil**

Probably the most important macro environmental factor that affects the voyage costs is the cost of fuel oil or bunker oil as it is also called. Bunker oil accounts for approximately 47% of the total costs of the voyage. Even though you can say that shipping companies cannot affect the price of bunker oil, you can say that they have some influence on the level of fuel consumption. History shows that when bunker prices are at a high level, shipping companies strives to develop and find new innovate ways to reduce the fuel consumption. Huge amount of resources are being used to design and develop more fuel-efficient ships, which results in a lower overall consumption of bunker oil (Stopford, 2009).
For a ship sailing through the NSR, fuel consumption for a container ship of 8,500 TEU sailing from Murmansk to Pusan in South-Korea is estimated to use 2,695 tons of fuel, whilst sailing through the Suez-Canal the same vessel would have a fuel consumption of 4,410 tons of fuel oil. This indicates fuel saving of 1.715 tons per trip, which also means that if bunker prices increase the amount of savings per trip also increases (www.esi.nus.edu.sg).

From the survey it is clear that the potential savings of bunker oil, and the related bunker costs, are considered the main benefits of sailing the NSR. 65, 63% of the respondents answer that they consider this as a main benefit. This is the second most frequent answer after “shorter distance/time”. In the interview with Pierre Cariou, he too gives a remark of the benefits related to saved fuel consumption. Although, he sees this in relation to other costs, such as transit and insurance fees, and concludes that it is questionable whether the potential for saved fuel costs will outweigh the increase in other costs.

6.1.3 Social-Cultural Factors

Social-cultural factors represent the culture of the society in which the company operates in. It involves the society’s view of each other, organizations, the nature and the universe. It can also involve demographics, age distribution, level of education, social classes, lifestyle trends, consumer attitudes and opinions, major events and influences, ethical issues and advertising and publicity (www.oxlearn.com).

The largest concern regarding macro environmental social-cultural factors for a Norwegian shipping company sailing the NSR, would be the local and global public reactions towards the use of the route. For example, Bellona—An independent non-profit organization that aims to meet and fight the climate challenges, through identifying and implementing sustainable environmental solutions—has raised concern regarding the Norwegian shipping companies use of Russian nuclear powered icebreakers (www.bellona.org). The negative publicity Norwegian companies utilizing the NSR can be subjected to; can further damage the reputation and image of their company.

Companies operate in a world with multiple standards of what constitute right or wrong behaviour. When different standards manifest themselves, judging whether or not an action is ethical, can
become a challenging dilemma. Organisations have to make compromising decisions, which might not be as good for all parties involved (Garsten and Hernes, 2009). As aforementioned, Russia is a country with perceived high level of corruption. For a Norwegian shipping company sailing the NSR it will involve, as previously stated, paying different fees to Russian authorities. This would mean that the companies using the NSR are supplying a steady stream of cash into a corrupt regime. This can result in a situation where the Norwegian company finds itself under scrutiny in the public eye.

Another social-cultural factor influencing the attractiveness of the NSR is the increasing world trade. Along with the relatively modest growth in global economy, the volume of world trade also rises. In July 2014, the world trade increased by 1.4 per cent (www.cpb.nl). One of the main drivers for this growth is a cause and effect of globalization. International trade has given the consumers around the world the possibility to enjoy a wider range of products, than they would if they only had access to the domestically made goods. Another important driver for the growth of world trade is the increased income per head. As a state’s overall income rises, consumers tends to shift their spending from basic good such as food and clothing to manufacturing goods, which may offer more scope for international trade (www.econ.brown.edu). For the shipping industry this means that more goods need to be shipped. Today, the world’s shipping industry is responsible for transporting 90 per cent of the world’s food, products and energy (www.forbes.com). Furthermore, Asia has passed North America as the largest market for European exports over the past decade, and a doubling of world trade is expected by 2020. This indicates that the NSR, and its attractiveness as a shorter connection between Europe and Asia, could be an important route to use in the future (www.thearcticinstitute.org).

An increasingly important issue in international shipping is the threat of piracy against merchant vessels. In 2011, there were 439 pirate attacks on merchant vessels and 45 vessels were hijacked worldwide (www.worldshipping.org). Sailing between Europe and Asia through the Suez Canal involves high risk of piracy and political instability. Currently there is lower possibility of encounters with pirates along the NSR (Blunden, 2012). This is expressed by some of the participants in the survey to be a beneficial element regarding the use of the NSR.
6.1.4 Technological Factors

The technological factors refer to the amount of new technologies, innovations, and developments, changes in mobile and information technology and the government’s spending on research. Technological factors are often focused towards digital and internet related issues, but it is important to not forget that material development, new methods of manufacturing, distribution and logistics all are important technological factors (www.oxlearn.com).

**Satellites**

For ships sailing via NSR, satellites are very important because a ship cannot adequately take real-time high-resolution images for other vessels to use. The images give valuable information about the conditions at sea, which will allow for more efficient and safe maneuvering in waters that are covered by ice (www.barentsobserver.com). The Norwegian AIS-satellite, the Canadian radar satellite program and various other satellites developed by the European Space Agency already provide grate contribution to cost effective sea-monitoring in the Arctic. EU’s impending Earth-observation program GMES (Global Monitoring for Environment and Security) and the European satellite navigation program Galileo will further contribute to cost effective, safer traffic and improved search and rescue in Arctic waters.

Furthermore, the IMO has started the work on modernizing the GMDSS (Global Maritime Distress Safety System) which is an international distress and safety system for ships. The GMDSS coverage in the High North is not sufficient today, but the hope is to further develop it to provide the best possible coverage also in the Arctic area (Stø Kurs 2020, 2013).

Existing satellite communication systems have little or no coverage north of 75 degrees. It is important to establish good communication in the Arctic, particularly in terms of broadband services to vessels. Communication satellites orbiting over the poles can solve this challenge. Several states with interests in the Arctic have started to study possible solutions for polar satellite communications, but there is so far no viable solution ready. In Norway this work is carried forward by the Norwegian Space Centre, on the behalf of the Ministry of Trade, Industry and Fisheries, through “Project satellite-based communication” (Stø Kurs 2020, 2013).
Radar Technology
The weather and conditions change fast in the Arctic region. It changes by the minute, and it could be more difficult to sail only hours ahead. Growlers, bergy bits, ice bergs and ice floes are all elements along the NSR that could impose large threats for the ship and the crew. Especially, when it is dark and operating in Arctic fog it is really challenging to detect these elements. Hence, new and improved reliable technology to detect these objects is crucial for safe navigation along the route. Various companies are working on developing such technology. For example, Radar Technology, a Norwegian company has developed an ice detector. It allows the captain of the vessel to see how the route looks ahead. It has a de-icing technology, which allows the radar to be completely ice free to insure that the radar works, even dough the rest of the ship is completely covered with ice. Furthermore, the transceiver is winterized so it can execute the task needed even in extreme weather conditions. The system can also be managed by an ice-pilot, the platform and display looks the same as a navigational radar, which means that an ice-pilot do not need any extra training to learn how to use it (www.radar-technology.com).

Ice and weather conditions are mentioned by Pierre Cariou as one of the main challenges for shipping via the NSR, and it is also the most frequent answers we received to the question concerning challenges and obstacles for shipping via the NSR, in the survey. It is clear that Norwegian shipping companies consider this a major challenge. This highlights the importance of reliable and improved technological aids for safer navigation in polar waters.

Ship structure and engines
For ships to be sailing along the NSR it needs to satisfy a number of criteria. It needs to have a certain level of icebreaking capability, have a safe ship design with tolerable reliability of the hull, rudder and propellers against expected ice loads. Another important issue is the motors. Sailing along the NSR is very harsh for the engines and an engine failure could face a serious threat. Hence, special measures of inspection and maintenance needs to be developed. New technology to prevent emissions from the engine also will also be needed (Sasakawa, 2001).

It is highly likely that, in line with rising technological requirements for navigation in the Arctic region, additional new technological aids will be developed in the coming years. Especially, environmental assessments with regards to NSR activity. A company planning to start operations in
the NSR will have to follow this development closely, and be prepared for continually upgrades in line with new requirement.

6.1.5 Environmental Factors

Environmental impacts can include issues such as weather and climate change, laws and regulation on environmental pollution, waste management, and endangered species (www.oxlearn.com).

**Climate Change**

Climate change and impacts of climate change are among the greatest challenges facing the world today, and the reduction of CO2 emissions is a politically and economically complex subjects. Rising global average temperatures is related to the increasing concentration of greenhouse gases in the atmosphere over several decades.

The climate is a global issue and can only be resolved through broad international cooperation. The goal of the global effort under the directory of the United Nations is to limit a temperature rise to below 2°C compared to pre-industrial levels. According to the Intergovernmental Panel on Climate Change (IPCC), the leading international body for the assessment of climate change established by the United Nations, this will demand that global greenhouse gas emissions be reduced by 50-85 per cent by 2050, compared with the level in 2000. Such large emission reductions will only be possible if all major countries and sectors reduce emissions significantly. It will, among other things, require increased production of renewable energy, more energy efficiency measures, less use of fossil fuels and cessation deforestation. In order for such a development to be realistic, greenhouse gas emissions must be priced (Stø Kurs 2020, 2013).

The global shipping industry is naturally also affected by the changing global climate. According to the Chairman of the International Chamber of Shipping (ICS) “The ultimate goal of the shipping industry is simple: zero accidents, zero loss of life and zero pollution” (Polemis, 2012). For this grand goal to be realizable, major changes must be expected in the industry.
**Emissions**

Shipping is regarded as the most environmentally friendly form of transportation measured in energy consumption per ton-kilometers. International shipping only accounts for about 3% of global emissions today, however increased international trade will contribute to increasing emissions (Stø Kurs 2020, 2013). In 2011 global CO₂ emissions rose by 3.2% from the 2010 level, which itself was up nearly 6% from the previous year. This increasing growth in global emissions has resulted in mitigation efforts in all sectors, and placed the international shipping industry under increasing scrutiny (Anderson and Bows, 2012). Climate impacts and air pollution from shipping activities are not just limited to the Arctic region. However, efforts to address global emissions will also have an impact on operations in the Arctic (www.imo.org).

The Arctic atmosphere during winter is cold, dry, dark and layered. This affects how emissions will spread and convert. Emissions within the stable Arctic area of high pressure that forms in the winter will be stored unchanged for a long time. When the sun returns and stability is disrupted during spring, reactions will be initiated. There is considerably uncertainty related to what these reactions will be like. However, compared to vessels sailing in other parts of the world, the distinct conditions in the Arctic region may lead to different and more stringent regulation of air emissions imposed on vessels sailing in Arctic waters (Økt skipsfart i Polhavet, 2013).

Reduced fuel consumption and the possibility of lower emissions will be important drivers for increased use of the NSR for intercontinental sea transport. This is also expressed by Pierre Cariou, and the companies surveyed to be two of the major advantages in relation to the use of the NSR. Professor Cariou further states that sailing the NSR can significantly reduce emissions.

Sailing the NSR might result in lower overall emissions from shipping. Significantly shorter distances traveled will yield lower fuel consumption, but if traffic in the future increases to the extent that icebreaker assistance and convoys become bottleneck, the pending vessels can absorb this advantage (Økt skipsfart i Polhavet, 2013).

**Accidental Pollution**

One of the main concerns related to increasing traffic along the NRS, and in the Arctic region in general, is the accidental spill of oil and chemicals. Extreme weather conditions, periodically
darkness, inadequate mapping and communications systems as well as ice covered waters poses a constant challenge (Stø Kurs 2020, 2013). Oil spills resulting from vessel accidents take place worldwide, however, challenging Arctic operations may increase the risk of accidents. Currently, there are few methods for recovering spilled oil in ice covered waters (DNV, 2010). Consequently, if an oil tanker has an accident in the Arctic Ocean, it could have serious environmental consequences (www.imo.org).

Furthermore, due to the remoteness of the areas in the Arctic search and rescue and emergency response to acute pollution is challenging and costly, and can consequently increases the severity of accidents. Because of the characteristics of the Arctic region, which makes search and rescue operations difficult, it is very important for companies that operates there to work on reducing the risk of accidents, and to be able to handle crises to a greater extent than is required in other waters (Stø Kurs 2020, 2013).

The possible impact the aforementioned threat has on the environment also influences another aspect of shipping, namely shipping insurance. The remoteness of the area, the difficulties of search and rescue, the lack of adequate method for recovering oil spills and the vulnerable environment in the region should be seen in relation to insurance. And, if we include the hazardous weather and ice conditions, it is clear that insurance premiums for vessels operating in Arctic waters will be high. Shipping insurance is an essential service to the industry, and it is generally agreed that without insurance commercial navigation in the Arctic region will not bee economically viable. The lack of historical data and statistics makes it difficult for insurers to compose overall risk assessments related to sailing the NSR. As a result the provision of insurance for vessels operating in the Arctic has been handled on a case-by-case basis, expensive and also requiring self-insurance (www.arctic-search.com).

The level of coverage and cost of insurance is an obstacle several of the surveyed companies express as a concern in relation to sailing the NSR. As one company put it: “Risk of ice, which in itself represent a danger and an obstacle depending on vessel ice class. Beyond that the place is hardly habituated, meaning rescue in distress situations would be difficult and expensive. Hence, more risky than conventional alternatives, resulting also in high insurance premium”.
Endangered species and waste management

The ecosystems in the Arctic Ocean are so far hardly affected by human activity. Local pollution has been small, and conditions are therefore generally good; natural processes dominate. Activity outside the Arctic region has, however, already started to influence the systems. Actually, air temperatures in the Arctic have increased twice as much as the global average. Climate changes not only affect the ice, but also the whole Arctic system. Pollutants transported into the area by ocean currents and wind, expose Arctic animals, i.e. polar bears, to harmful effect.

In addition, increased traffic along the NSR is expected to threaten the marine environment in the region. Vessels are the main reason for the introduction of foreign organisms to new sea arias, and vessels create noise that can disturb marine mammals (Økt skipsfart i Polhavet, 2013).

Waste management is another issue that can be challenging in the region, due to the lack of proper port facilities. Especially when ships de-ballast, they expose the Arctic environment to species that are unfamiliar and possibly devastating for the region (www.imo.org). Shipping companies considering the use of the NSR will have to expect that new laws and regulations to protect the marine environment will be developed and implemented in the future. Shipowners will, amongst other, have to install very expensive new equipment to comply with new regulation in relation to ballast water (Polemis, 2012).

Norwegian Governmental Influence

Another factor that can affect a Norwegian shipping company’s use of the NSR is the fact that the Norwegian government’s objective is that the Norwegian maritime industry will be the most environmentally friendly and lead in the development of new solutions. The Norwegian government works towards establishing global requirements and mechanisms for reduction of greenhouse gas emissions from international shipping (Stø Kurs 2020, 2013). Since the goal of the Norwegian government is for the Norwegian industry to be the most environmentally friendly, Norwegian shipowners might be subjected to even more stringent regulation. And, since the Arctic environment is perceived to be highly vulnerable, restrictions concerning sailing in Arctic waters might occur.
The Norwegian government is working on initiating a plan of action for green shipping which also will encourage increased use of LNG, particularly in the commercial shipping fleet (Stø Kurs 202, 2013). The use of LNG is, however, highly challenging due to the lack of infrastructure and the cost of LNG compared to bunker oil. In addition, the availability of LNG and LNG bunkering facilities are also limited (Økt skipsfart i Polhavet, 2013). Because of these challenges, it is questionable whether the use of LNG can be a viable option to protect the Arctic environment, at least in the short term.

Arctic Climate Impact Assessment

The Arctic plays a huge role on the global climate, and as mentioned earlier the climatic changes in this region are particularly intense. In 2004 the Arctic Climate Impact Assessment (ACIA) was introduced. The ACIA was prepared in response to a request from the Minister of the Arctic Council. “The main objective of the ACIA was to evaluate and synthesize knowledge on climate variability and changes and increased ultraviolet radiation, and support policy-making processes and the work of the Intergovernmental Panel on Climate Change (IPCC), ACIA should address environmental, human health, social, cultural, and economic impacts and consequences, including policy recommendations” (www.amap.no).

In the following the key findings in the ACIA (2004) report concerning the impact of climate change on the Arctic are listed:

1. Arctic climate is now warming rapidly and much larger changes are projected.
   a. The average arctic temperature has increased at almost twice the rate as the rest of the world – With some variations across the region.

2. Arctic warming and its consequences have worldwide implications.
   a. The melting of the highly reflective arctic snow and ice reveals darker land and ocean surfaces, which increases the absorption of the sun’s heat and further warming the planet.
   b. The glacial melt also add more freshwater to the ocean, raising global sea level.

3. Arctic vegetation zones are very likely to shift, causing wide-ranging impacts.
a. Tree line is expected to move northward and to higher elevations, with forests replacing a significant fraction of existing tundra, and tundra vegetation moving into polar deserts.

b. More-productive vegetation is likely to increase carbon uptake, but reduced reflectivity of the land surface is likely to outweigh this, causing further global warming.

4. Animal species’ diversity ranges, and distribution will change.
   a. The reduction of sea ice will reduce marine habitat for polar bears, ice-inhabiting seals, and some seabirds, pushing the species to extinction.
   b. As new species move in, human transmitted animal diseases could pose as an increasing health risk.

5. Many coastal communities and facilities face increasing exposure to storms.
   a. Reduction in sea ice and rising sea level would allow higher waves and storm surges to reach the shore.
   b. Higher risk of flooding

6. Reduced sea ice is very likely to increase marine transport and access to resources.
   a. The reduction in sea ice will increase the possibility of marine access to the Arctic’s natural resources.
   b. Seasonal opening of the Northern Sea Route is likely to make trans-arctic shipping feasible.
   c. Sovereignty, security and safety issues, as well as cultural, and environmental are likely to arise.

7. Thawing ground will disturb transportation, buildings, and other infrastructure.
   a. Global warming will disrupt the transportation and industry on land, including oil and gas extraction and forestry due to the shortening of periods which ice roads and tundra are frozen.

8. Indigenous communities are facing major economic and cultural impacts.
a. Indigenous peoples depend on hunting polar bears, walrus, seals, and caribou, herding reindeer and fishing.

9. Elevated ultraviolet radiation levels will affect people, plants, and animals.
   a. As a result of the ultraviolet radiation in the Arctic that is projected to remain elevated, the current generation people is likely to receive a lifetime dose of UV that is about 30% higher than any prior generations. This could cause skin cancer, cataracts, and immune system disorders in humans.

10. Multiple influences interact to cause impacts to people and ecosystems.
    a. Chemical pollution, overfishing, land use changes, habitat fragmentation, human population increases, and cultural and economical changes.

(www.amap.no)

6.1.6 Summarizing the PESTEL analysis
Based on the above presented PESTEL analysis, the following table offers an overview of the main factors believed to influence the attractiveness of the NSR.

Table 2: PESTEL summary

<table>
<thead>
<tr>
<th>Macro Environmental Factors:</th>
<th>Important Factors in Relation to the NSR:</th>
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<tbody>
<tr>
<td>Political/Legal</td>
<td>- Lack of infrastructure – dependant on Russian will and ability to develop</td>
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<tr>
<td></td>
<td>- Increasing level of political tension</td>
</tr>
<tr>
<td></td>
<td>- High level of corruption in Russia</td>
</tr>
<tr>
<td></td>
<td>- Russian jurisdiction and regulation – possibility of misuse of power</td>
</tr>
<tr>
<td></td>
<td>- The Polar Code – new law and regulation is definite</td>
</tr>
<tr>
<td>Economical</td>
<td>- Development in world economy and trade</td>
</tr>
<tr>
<td></td>
<td>- Funding required for heavy investments in ice classed vessels – increasingly difficult and costly to get funding</td>
</tr>
<tr>
<td></td>
<td>- Fluctuations in interest rates</td>
</tr>
<tr>
<td></td>
<td>- Bunker oil cost – possible savings related to the use of the NSR</td>
</tr>
<tr>
<td>Social-cultural</td>
<td>- Public reactions to the use of Russian nuclear powered icebreakers –</td>
</tr>
</tbody>
</table>
possibly damaging reputation
- Public reaction to the ethical dilemma of dealing with a corrupt nation
- Increasing demand for goods to be shipped
- Expected growth in European export to Asia

### Technological

- Insufficient coverage of the Global Maritime Distress Safety System
- Existing satellite communication systems have little or no coverage north of 75 degrees
- New and improved radar technology must be implemented
- New requirements to ship structure and engines
- Special measures of inspection and maintenance
- Requirements for new technology to reduce emissions is likely

### Environmental

- Global Climate Change – imposes stricter regulation on the shipping industry in general
- More stringent emissions regulation on vessels in the Arctic
- Possibility of reduced fuel consumption and lower emissions by sailing the NSR
- Serious environmental consequences of accidental pollution in the Arctic – lack of methods for recovering spilled oil in ice covered waters – leading to expensive insurance
- Increased traffic might pose a threat to endangered species
- Waste management – new regulation is expected, leading to requirement of new expensive equipment
- Norwegian Governmental influence – possibly more stringent environmental regulation enforced on Norwegian vessels
6.2 Risk analysis of the Northern Sea route

In this section we will present and identify a number of risk factors within the four risk categories presented in chapter 4 that are highly relevant for shipping companies sailing along the NSR. Here, we will try to answer how these risks directly can affect a company and various risk scenarios will be presented. After identifying and categorizing these risks, we will further give examples on how to measure these risks, and briefly explain the impact of each scenario on the business. After the risks have been identified, we will discuss which potential risk management methods that can be used to mitigate the risks.

6.2.1 Price risks

The first risk category is price risks. As mentioned earlier in this paper, price risk refers to the uncertainty of future cash flows due to the risk of changes in the prices a firm can demand for its goods (output prices) and the changes in the prices that a company must pay for labor, raw materials etc. (input prices). We further divided price risks into four subcategories; freight rate risk, operating costs risk, interest-rate risk and asset-price risk.

Freight Rate Risk

For a shipping company, the freight rate risk is one of the most important risk factors. Freight rates are highly volatile, and the freight rates make a huge impact on the earnings and profitability of the firm (Angelidis and Skiadopoulos, 2008). Sailing the NRS will, however, not impose greater freight rate risk to a shipping company than sailing the traditional route through the Suez Canal. The importance of risk management in the freight market has been recognized in the shipping industry for a long time, and methods to hedge these risks are already implemented in the day-to-day business of most of the companies in the industry. Therefore, the freight rate risk will still be characterized as high, but the risk will not be greater because of using the NSR.

One of the most used hedging methods against freight rate risk is called Forward Freight Agreement (FFA). A FFA is a contract in which a ship-owner, charterer or speculator agrees with a
counterparty to settle a freight rate or hire rate for a shipment at a certain time in the future. A ship-
owner can sell FFAs to protect the company against an unexpected decline in freight rates, which
means that the company protects their future freight income by hedging themselves from the risk of
a decline in freight rates—since when freight rates decline, the drop in freight income will be
compensated through a gain in the forward position (Alizadeh & Nomikos, 2009).

Operating costs Risk
Along with the volatility in freight rates, volatility on the costs side is also an important risk factor
for shipping companies. Hence, profit margins are highly dependent on the operating costs. Sailing
the NSR could have numerous impacts on the overall operating costs of a single voyage. For a
shipping company sailing the NSR the most important risk of operating costs will be the cost of
fuel, icebreaker fee/NSR transit tariffs, emissions fees and insurance costs.

Bunker costs
Today, the costs of bunker oil represent a large portion of a shipping company’s operating costs.
Alizadeh & Nomikos (2009) states that, on average, bunker costs accounts for more than 50 per
cent of the total voyage costs. Hence, changes in bunker prices could potentially have a great
impact on the shipping company’s operating profit. Naturally, in order for shipping companies to
secure their operating profit, they try to control their exposure to fluctuations in the bunker-market.

To hedge the risk of fluctuations in bunker prices, shipping companies use forward contracts,
bunker swap contracts and options on bunker prices. A forward bunker contract is defined by
Alizadeh & Nomikos (2009) as “an agreement between two parties to exchange a specified
quantity of bunker of certain quality, at an agreed price, at a certain delivery location and a
specified time in the future”.

Sailing via the NSR will reduce the fuel consumption with approximately 35%, and therefore, one
could argue that it reduces the exposure to this risk since the fuel needed per voyage would be less
than sailing through the Suez Canal (Furuichi et al. 2013). However, unexpected changes in weather
and ice conditions, might lead to delays, which means that the vessel could potentially have to await
further sailing and be at idling speed. Hence, consuming fuel without moving forward. This could
potentially diminish the advantage of reduced fuel consumption per voyage, and lend companies to
the same level of risk exposure.
Icebreaker fee
As mentioned, sailing along the NSR will require the shipping company to pay a set fee to sail the route and pay for the mandatory icebreaker assistance. The icebreaker support is going to be performed by Russian authorized icebreakers, and the support’s main objective is to ensure the safety of navigation for a ship sailing the NSR. As of today, the amount that a shipping company sailing along the NSR has to pay in icebreaker fee is dependent of the vessels ice classification, the shipments weight and the length of needed icebreaker support (see example in table 3 below).

Table 3: Icebreaker fees

<table>
<thead>
<tr>
<th>Vessel’s ice strengthening class</th>
<th>Pilotage within 1 zone</th>
<th>Pilotage within 2 zones</th>
<th>Pilotage within 3 zones</th>
<th>Pilotage within 4 zones</th>
<th>Pilotage within 5 zones</th>
<th>Pilotage within 6 zones</th>
<th>Pilotage within 7 zones</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>893,68</td>
<td>1072,42</td>
<td>1251,16</td>
<td>1429,90</td>
<td>1608,63</td>
<td>1787,37</td>
<td>1787,37</td>
</tr>
<tr>
<td>Ice 1</td>
<td>625,58</td>
<td>750,70</td>
<td>875,81</td>
<td>1000,93</td>
<td>1126,04</td>
<td>1251,16</td>
<td>1251,16</td>
</tr>
<tr>
<td>Ice 2</td>
<td>580,90</td>
<td>697,07</td>
<td>813,25</td>
<td>929,43</td>
<td>1045,61</td>
<td>1161,79</td>
<td>1161,79</td>
</tr>
<tr>
<td>Ice 3</td>
<td>536,21</td>
<td>643,45</td>
<td>750,70</td>
<td>857,94</td>
<td>965,18</td>
<td>1072,42</td>
<td>1072,42</td>
</tr>
<tr>
<td>Arc 4</td>
<td>446,84</td>
<td>536,21</td>
<td>625,58</td>
<td>714,95</td>
<td>804,32</td>
<td>893,68</td>
<td>893,68</td>
</tr>
<tr>
<td>Arc 5</td>
<td>442,37</td>
<td>520,85</td>
<td>619,32</td>
<td>707,80</td>
<td>796,27</td>
<td>884,75</td>
<td>884,75</td>
</tr>
<tr>
<td>Arc 6 – Arc 9</td>
<td>437,91</td>
<td>525,49</td>
<td>613,07</td>
<td>700,65</td>
<td>788,23</td>
<td>875,81</td>
<td>875,81</td>
</tr>
</tbody>
</table>

www.arctic-liio.com
100 Rubles = $25 www.valutakalkulator.net

Today, the risk for fluctuations in icebreaker fees is theoretically non-existing, but actors in the industry are afraid that the Russian government will use their political sovereignty along the NSR to their advantage. This could result in an increase in the company’s operating costs, and the cost/earnings ratio related to operations along the NSR could go from being beneficial, to a losing project, which may prove to be disastrous and in worst case scenario lead to bankruptcy.

Insurance costs
The insurance premium for sailing via the NSR is currently comparable with the route through the Suez Canal. Insurance companies take a sit-and-wait approach, this is due to the fact that it have not been any major insurance claims along the NSR. But it is highly likely that the insurance companies will increase the insurance premium to respond to possible future accidents (Erikstad and Ehlers, 2012). This is also in line with what the Norwegian shipping companies that answered the
questionnaire perceived as one of the main challenges and risk concerning the use of the NSR. Some examples of what the respondents answered is; “there are still uncertainties about insurance coverage”, “Risk of ice, which in itself represents a danger and an obstacle depending on vessels ice class. Beyond that the place is hardly habituated, meaning rescue in distress situations would be difficult and expensive. Hence, more risky than conventional alternatives, resulting in high insurance premium” and “Expect a very high cost for passage thru arctic, technical support, insurance and salvage”.

Furthermore, even though it is possible to sail the NSR without the help of an icebreaker, insurance companies typically require that an icebreaker escort the vessel. Insurance companies do this to avoid the risk for a small accident to develop into a large and major claim, which means that the ship-owner have to pay for the escort even though it is unnecessary (Erikstad and Ehlers, 2012).

Insurance is a hedging method in itself, but to hedge against the risk of increased insurance premiums it is important for a shipping company to know which factors that affect the insurance premium. First, it is important for the ship-owner to emphasize the importance of having a highly competent crew for the specific purpose of sailing in Arctic waters. Secondly, if the ship-owner decides to order ships that have the highest ice-classification, it would give the insurance company a good signal. Thirdly, the risk premium given will be dependent on the company’s overall risk, the industry the company operates in and historically claims. Therefore, it could be beneficial for the company to use a portfolio management strategy to reduce the overall risk of the company.

**Interest-rate risk**

The risk related to interest rates comes from the company’s exposure to changes in interest rates. As mentioned, the shipping industry is highly capital-intensive, and most of a company’s ships are financed through loans. Hence, fluctuations in interest rates can potentially have a large effect on the company’s profits. In some cases, unexpected changes in interest rates may create cash flow and liquidity problems, which could mean that the companies no longer are able to service their debts (Alizadeh & Nomikos, 2009).

Naturally, the largest interest-rate risk that a company operating along the NSR has to address is the risk of fluctuations on the interests from loans on their ships. To sail via the NSR, a renewal of the
company’s fleet will be required, which is very costly, and most of the capital needed are provided through loans via international commercial banks. Furthermore, the terms of loans are dependent on several factors, some examples are; the company’s operational and financial capability, their creditworthiness, reputation and fleet size and market conditions (Alizadeh & Nomikos, 2009).

To manage the company’s exposure to the risk of fluctuations in interest rates, hedging techniques similar to those used to hedge freight and bunkers are used, namely; Interest-rate forwards, interest-rates futures, interest-rate swaps and interest-rate options (Alizadeh & Nomikos, 2009).

**Asset-price risk**

Asset-price risk, which comes from fluctuations in the price of the assets of the company, is potentially a huge risk factor for shipping companies choosing to sail via the NSR. As mentioned, sailing through the NSR requires an upgrade on existing fleet, which is highly expensive. The major assets for a shipping company are the value of the ships they own, and therefore the volatility in ship prices will affect the balance sheet value of the company. It could also result in a decrease in the creditworthiness of the company and the company’s ability to service debt obligations. This is due to the fact that ships are used as collateral in ship-finance transactions (Alizadeh & Nomikos, 2009).

Since there is a high uncertainty level concerning the future availability of the NSR, the risk is that if the NSR turns out to be sailable for large parts of the year and a shipping company decides to select the “no ice class” alternative, the company’s competitive position will be reduced. On other hand, if the company decides to invest in ice class ships for the purpose of sailing via the NSR, and the ice conditions gets worse or political, commercial or regulatory development do not develop as expected, the ships will not be usable for their purpose, which implies that the value of the ships will be reduced significantly (Erikstad and Ehlers, 2012). This can impose large threats to a company. A renewal of the fleet is a huge capital investment, and if the company fails with its investment it could lead to huge losses or in worst-case scenario, bankruptcy.

Traditionally, many shipping companies chose to eliminate ship-price risk by not owning their ships, instead leasing or chartering them on a long-term time-charter or a bareboat-charter basis. But for shipping companies choosing to sail the NSR the downside of this solution is the lack of ice
class ships in the industry, and investors would not profit from any capital gain or ship-price appreciation. Therefore, portfolio management and diversification could be a better alternative to manage this risk (Alizadeh & Nomikos, 2009).

### 6.2.2 Credit risk

Credit risk arises from the uncertainty of whether a counter-party to a transaction will oblige its financial obligations in full and on time. It arises because, in shipping, most of the deals, trades and contracts are agreed upon on a principal-to-principal basis, which means that they have to rely on each other’s ability to honor the agreement. Loss due to credit risk can come from an incomplete fulfillment, a delay or a postponement (Alizadeh & Nomikos, 2009).

A ship-owner will not be exposed to more credit risk if he chooses to sail via the NSR compared to sailing via the Suez Canal. This is because they will probably deal with the same customers as when sailing the Suez Canal. We include credit risk in this analysis because it is very important for shipping companies, regardless of the rout they sail, to be aware of the great impact credit risk could have to the firm performance.

One of the major components of credit risk is default risk, and credit risk is often expressed in one of the following terms: *Probability of default, loss-given default* and *distance to default*. Default risk is the risk of a party to fail in fulfilling its contractual obligations, loss-given default can be defined as the financial loss that could occur if the counter-party fails to meet his obligation, and lastly distance to default is defined as a pure statistical measure of credit risk (Alizadeh & Nomikos, 2009).

Measuring the counter-party’s default risk and creditworthiness is a highly difficult task and there are several different factors that can affect it. Examples of these factors can be *qualitative* and *quantitative*. Qualitative analysis is based on firm specific factors that you cannot quantify, factors like: the reputation of the firm and their business history, managerial expertise, experience and ethics, how they stand in the market, financial flexibility, strength and operational flexibility so that the firm can adapt to changes under difficult market conditions etc. These factors cannot be directly measured, but can be used to assess and compare. On the other hand, quantitative risk analysis
involves statistical or mathematical information and models to estimate the counter-party’s probability of default. Firms can use credit ratings and rating agencies, use the yield premium of a bond, the Merton’s model or the black-Scholes to estimate a counter-party’s probability of default (Alizadeh & Nomikos, 2009).

Furthermore, to manage the credit risk Alizadeh and Nomikos (2009) recommend using one or more of five different methods. **Collateralization**—the firm dealing with credit risk takes demands some form of collateral for security, **Downgrade triggers**—when the creditworthiness of the counter-party decreases, the party dealing with credit risk is allowed to change the terms of the contract, **Contract design and netting**—incorporation of clauses for default and non-performance compensations, **Diversification**—reducing the overall credit risk of a portfolio by diversify the firm’s contracts, and **Credit derivatives**—payoffs depend on the performance of one or several entities in meeting their contractual agreement, examples of credit derivatives can be credit default swaps, total return swaps and credit spread options (Alizadeh & Nomikos, 2009).

### 6.2.3 Pure risk

Compared with price risk, the potential liability for a company as a result of pure risk can be enormous to the size of the business and could actually threaten the whole firm’s viability. We can define pure risk as the risk of a reduction of the value of business assets due to physical damage, accidents and losses, and it also cover the risk of loss due to physical risks, technical failure and human errors and legal liabilities for damages in relation to actions of the company (Alizadeh & Nomikos, 2009).

A ship sailing via the NSR will experience large amounts of pure risk factors, and sailing the NSR, compared to traditional routes, exposes a company to a higher level of pure risk. Ice, weather conditions, technical failures, damage to the ship, accidents to the crewmembers, delays, etc. are all factors which could lead to both indirect losses and direct losses. Direct loss is due to physical damage to the firm’s property and assets—machinery, equipment, raw materials and inventory. While indirect losses or consequential losses involves losses related to other financial losses that arises from the damage in the form of opportunity cost.
For a shipping company to evaluate the pure risk of sailing the NSR, they need to construct a distribution for frequency of occurrence of each risk exposure, develop a loss severity distribution (what is the level of loss if an event occurs?) and thirdly combine the two for a construction of a total annual loss distribution or discounted life-time loss distribution (Gupta, 2013).

Insurance contracts are the most commonly used method to manage pure risks. It is the most commonly used method because pure risks involve only the chance of loss; they are pure in the sense that they do not provide the chance of any profit. But shipping companies can also use other methods to reduce their exposure to pure risks of sailing the NSR. Methods like training of crewmembers to reduce the chance of human failure, development and usage of new technologies, improvements and strengthening of the company’s ships and implementing routines for handling crisis, can mitigate risk.

### 6.2.4 Political risk

The last category is political risk. Accenture, as mentioned earlier, defines political risk as; “uncertainties to business objectives created by political actors or political conditions” (Beardshaw, Cattaneo & Gomes, 2012). Examples of political risk a shipping company that operates along the NSR can experience is contract defaults due to Russian politically-driven failures to deliver on a contract, license cancellations in relation to Russian approvals in sailing the route or changes in initial contracts, and protests from the community or environmental organizations along the NSR. The Russians can also be expected to make regulatory changes that benefit the state, like high taxations. In addition, companies sailing the NSR can be exposed to the threat of terrorism and piracy, however this is more unlikely. In fact, the risk exposure associated with piracy is reduced by sailing the NSR compared with sailing through the Suez Canal. On the other hand, the total political risk exposure is perceived to be higher for companies using the NSR because of the political instability and level of corruption in Russia, as described in the above PESTEL analysis.

Today, it is hard to measure how large an impact these risks would have for a company operating along the NSR, but it is safe to say that it could potentially have a huge impact on the firm. An example on how to measure a political risk is by the use of a discounted cash flow analysis, it can
be used to measure the financial impact on a change in taxes, regulations or delays, and how these changes would increase or decrease the company’s cash flows.

Furthermore, a firm has a variety of methods that can be utilized to manage these political risks. Examples can be: Portfolio diversification, political risk insurance, personnel management, joint business ventures, lobbying or financial hedging. All of these methods could help the firm reduce their potential exposure to political risk (Beardshaw, Cattaneo & Gomes, 2012).

In the following a summarizing table is provided. The table provides an overview of the level of risk exposure a company can expect to be exposed to by sailing the NSR compare to the more traditional routes through i.e. the Suez Canal.

Table 4: Level of risk exposure

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Level of risk exposure for sailing NSR compared to traditional routes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Price Risk</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overall – Higher level of exposure</td>
</tr>
<tr>
<td><strong>Freight Rate Risk</strong></td>
<td>Equal level of exposure</td>
</tr>
<tr>
<td><strong>Bunker Cost Risk</strong></td>
<td>Lower level of exposure</td>
</tr>
<tr>
<td><strong>Icebreaker Cost Risk</strong></td>
<td>Higher level of exposure</td>
</tr>
<tr>
<td><strong>Insurance Cost Risk</strong></td>
<td>Higher level of exposure</td>
</tr>
<tr>
<td><strong>Interest-Rate Risk</strong></td>
<td>Higher level of exposure</td>
</tr>
<tr>
<td><strong>Asset-Price Risk</strong></td>
<td>Higher level of exposure</td>
</tr>
<tr>
<td><strong>Credit Risk</strong></td>
<td>Equal level of exposure</td>
</tr>
</tbody>
</table>
6.3 Benefits and Challenges of sailing the Northern Sea Route

In this section the main benefits and challenges related to sailing the NSR, relative to traditional routes, will be presented. We have summarized the findings from our preceding analysis, and combined this with the results from the survey. The companies that participated in the survey were asked to provide answers to the following questions; what do you consider the main benefits for shipping via the Northern Sea Route? and What do you consider the main challenges/obstacles for shipping via the Northern Sea Route? The following table presents the most frequently cited benefits and challenges, in combination with benefits and challenges that we derive from the results of the analysis above.

Table 5: Benefits and Challenges of NSR

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shorter distance</td>
<td>Ice and weather conditions – challenging to navigate</td>
</tr>
<tr>
<td>Potential time saving</td>
<td>Infrastructure</td>
</tr>
<tr>
<td>Potential cost saving</td>
<td>Remote conditions – Search and Rescue</td>
</tr>
<tr>
<td>Bunker Oil savings</td>
<td>Political issues - Russia</td>
</tr>
<tr>
<td>Less emissions</td>
<td>Corruption</td>
</tr>
<tr>
<td>No piracy threats (today)</td>
<td>Insurance</td>
</tr>
<tr>
<td></td>
<td>Seasonal availability</td>
</tr>
<tr>
<td></td>
<td>Unpredictability – challenging to plan/forecast</td>
</tr>
<tr>
<td></td>
<td>Cost uncertainties</td>
</tr>
<tr>
<td></td>
<td>High investments</td>
</tr>
<tr>
<td></td>
<td>Regulations</td>
</tr>
<tr>
<td></td>
<td>Technological aspects and requirements</td>
</tr>
</tbody>
</table>
6.4 Industry change

Change in industry environment can be driven by technology, politics, economic growth and a huge amount of other influential factors. In some situations these factors can create massive, unpredictable changes, while in other situations change can be more gradual and predictive. Furthermore, evolutionary processes can involve change which is limited and slow, or change which is more disorderly and chaotic. Change can also lead to competitive advantage for companies, but this is highly dependent on a company’s ability to respond to change (Grant, 2010).

The opening up of previously ice covered Arctic waters represents change to the International shipping industry, including Norwegian shipowners. Environmental changes in the industry can challenge the persistence and value of previously held competitive positions (Farjoun, 2007). In some circumstances environmental changes can seem to come out of nowhere and render companies confused and already lagging behind.

The characteristics of the NSR identified in the previous analysis sections, indicates that the changing circumstances in the industry are more likely to be gradual and incremental than radical and unpredictable. What is known at present time is that the ice is melting; however there is no certainty on how much the ice will melt from year to year. This implies that there are still several uncertainties related to the future viability of the route, and operation along the NSR is associated with a high level of risk. In addition, there are several challenges linked to the current insufficient infrastructure, huge geographical distances, and harsh climate conditions; which again requires investments in new ice classed vessels. New vessels needs to be built, and this is not done overnight. Newbuildings will not be available for at least 2-3 years from the contract date (Stopford, 2009), by which time conditions and regulatory requirements may have changed in the Arctic region, implying even more risk. Furthermore, the interview with Arild Moe also revealed that the more recent rise in political tension is also likely to slow down the development of the route. He further stated that “a lot of the future development of the NSR is dependent on Russian authorities and their willingness to subsidize icebreakers and other elements of the infrastructure. The uncertainties surrounding Russian politics today has affected all long term investments”.
Based on the characteristics described above we therefore argue that Norwegian shipping companies are not exposed to radical change which could transform the industry over night. Rather the industry is faced with an opportunity to prepare for the future.

This is also in line with the commonly held belief within the Norwegian shipping industry. One of the questions included in the survey covered this topic; “Do you believe the Northern Sea Route holds the potential to become a viable option to the Suez Canal for shipping between Europe and Asia?”. The companies were given the option to answer yes or no, or within different time perspectives. The results show that 45.16 per cent believe the route has a potential within the timeframe of 10-15 years, and 9.68 per cent within the timeframe of 20-30 years. Together this represents nearly 55 per cent of all the respondents. A closer look at the results also revealed that as much as 83.87 per cent of the surveyed companies believe the NSR has potential to become a viable option.

Another question the surveyed companies were asked was; “Has your company, to your knowledge, considered using the Northern Sea Route as an alternative route between Europe and Asia?”. The results show that 77.42 per cent of the companies have not considered the alternative so far. However, when asked if they have considered the NSR for the future almost 40 per cent of the companies answered yes.

What can be interpreted from the results presented above is that the companies within the industry is aware of the projected and estimated potential the route offers, but they do not anticipate that the route will become viable in the nearby future.

Even though the change facing the industry is considered to be incremental and slow, this does not imply that the shipping companies should not respond. In contrast, they should still prepare for the future. Actually the nature of the change they face offers a great opportunity for the companies to think about what might happen in the future, and how they best can position themselves to capitalize on the opportunities the change represents. There are several aspects related to the future of the shipping industry that cannot be predicted, however this does not suggest that companies would not benefit from forecasts and other forward looking diagnostic tools.
As mentioned in the theory section of this paper, Day and Schoemaker (2005) suggest that a strong peripheral vision helps companies evaluate their future. Norwegian shipping companies could benefit from their proposed diagnostic tool, the “strategic eye exam”. This would involve asking open-ended questions to learn from the past, present and envisioning futures. Companies should not limit their evaluation to certainties, rather they should try to envision unthinkable scenarios. If companies are able to envision far-fetched scenarios, they are likely to increase their ability to see threats and opportunities at the periphery more clearly.

6.5 Analysis of the Norwegian shipping industry

Shipping companies all over the world is faced with the same opportunity to sail along the Northern Sea Route. Companies’ prior knowledge and competencies might however position them differently, and affect their ability to seize potential opportunities. The existence of a strong maritime cluster will also improve the companies’ ability to succeed. Therefore the purpose of this section is to investigate whether Norwegian shipping companies are in a position to benefit from the opportunities the Northern Sea Route potentially could offer in the future. First, we will examine the maritime cluster in Norway. Secondly, Porter’s framework for national advantage will be used to analyze the factors that contribute to the Norwegian shipping industry’s competitiveness. We will further analyze whether or not these factors also have the ability to enable Norwegian shipping companies to succeed in operations along the NSR.

6.5.1 The Norwegian Maritime Cluster

In contrast to nations that have specialist strengths in specific areas of the industry the Norwegian maritime industry is among the most comprehensive and cover a vast area of services, products and expertise (www.regjeringen.no). The maritime industry in Norway consist of a large merchant marine fleet, shipyards, ship equipment manufacturers, ship consultants and a plethora of other companies and institutions with maritime oriented activities. Strong interdependencies between actors in the various parts of the maritime sector, and an emphasis on innovation and entrepreneurship have historically contributed to a strong and dynamic maritime cluster (Benito et al., 2003).
History
Norway is one of the leading maritime nations in the world, and has a unique history as a shipping nation. Shipping has been central in the country since the Viking Age (Reve, 2009). The shipping industry emerged drastically from the mid-1800s, when liberalization and strong economic development gave the Norwegians an opportunity to enter the global shipping market. This industrial mobilization represented the inception of a comprehensive shipbuilding industry, based on local resources. In 1875, Norway was the world’s third-largest shipping nation with a national fleet operated by 60,000 seafarers (www.rederi.no).

The Norwegian maritime industry is based on human resources and competencies. Through generations, seafarer’s experiences and knowledge has been the building-blocks behind the strong and competitive maritime nation we see today. Today, the maritime cluster is Norway’s most knowledge intensive and innovative industry, and contributes approximately 11 per cent of all value creation in the country—when oil and gas is excluded (www.maritimt-forum.no).

Following the continuous growth in world demand in the 1960s, the Norwegian industry was able to capitalize on this growth. In the period 1960-1973 the industry was characterized by massive investments and expansions (Tenold, 2012), and from 1950-1970 shipping contributed to 50 per cent of Norway’s total export earnings (Jacobsen, 2011). Following this period was a time of crisis; a decline in demand for shipping services lasted throughout the 1980s. In 1987 the Norwegian International Ship Register (NIS) was established, and the industry once again had a positive outlook (Tenold, 2012).

Throughout history, Norwegian maritime activities have played a considerable part of the nation’s economy. The country’s extensive coastline and challenging geography and topography and infrastructure, has historically made land based transportation challenging, and transportation by sea the natural choice. Even though the infrastructure has been improved and land based transportation has been eased (Benito et al., 2003), the focus in Norway is still on sea transportation. As can be seen from the Norwegian government’s maritime strategy, the government aims for industry transportation, is to facility that more good can be transported by sea. This is a result of a goal for transportation to be efficient, environmentally friendly and safe. The Norwegian government argue that sea transportation is the best solution to support this goal (Stø Kurs 2020, 2013).
Since the 1960s Norwegian shipowners have owned more than half of the Nordic fleet in tonnage, and for long periods more than 60 per cent. One of the success factors in the Norwegian industry derives from their focus on niches such as chemicals, ro-ro/car, offshore service vessels and liquefied gas. In addition, dry-bulk carriers and tankers also represent important segments within the Norwegian shipping industry. However, the specialized segments have had increased importance since 1975 (Tenold et al., 2012).

Norway is still heavily involved in low-tech sub-sectors, where tankers and bulk ships are the most important segments, but other segments are experiencing a higher growth rate. Combination ships which are carrying more than one type of cargo have experienced a decrease of 45 per cent, while the fleet of offshore service ships doubled from 1988 to 2001. This indicates that there is a trend for more specialization within the industry in Norway (Tenold et al., 2012).

**Historical review of the Norwegian Shipping industry’s risk management**

Freight rates and vessel values are very volatile, and this is one reason for why the shipping industry is seen to be very risky. Large amount of money can be made and lost exceptionally fast in the shipping industry (Stopford, 2009). In this section we will take a look at how the Norwegian shipping industry, historically, has dealt with risk associated with operating in the industry.

The Norwegian shipping industry’s risk exposure has changed over time. In the second half of the nineteenth century, referred to as “The Sailing Ship Era”, risk was mainly related to the threats of the sea, and the capital investment was relatively small. In this period both activity risk and asset risk was rather low. In the early 1970s, the typical Scandinavian tanker owners was referred to by Michael E. Porter as the “gamblers among the gamblers of the shipping industry”, and when the shipping market collapsed in the 1970s and 1980s not many countries were as hard hit by the crisis as the Norwegians. The demand had increased rapidly from 1950 to 1973, and so did the world fleet. But the fleet in Norway developed different from the rest of the world, the fleet was larger, and as a result of frequent renewal, the fleet was also younger than the world average. One of the problems was that the shipowners invested all their money in one area, they invested in ships that were relatively inflexible and they operated a fleet of few large vessels, instead of many small ones. This development implies that the asset risk increased substantially. At the same time, many of the shipowners reduced the duration of the time-charters, and increased the portion of the fleet that was
operated in the spot-market, which lead to larger revenues when the market was good, but it resulted in inactivity and reduced income when the demand was lower than expected. This way of doing business also increased the shipowners activity risk, and now both asset risk and activity risk was high (Harlaftis, Tenold & Valdaliso, 2012)

1974 was the start of an almost fifteen-year-long depression on the freight rates in the tanker market. Very few of the Norwegian shipping companies, who operated as mentioned above, were operating with a profit. Sigval Bergesen, who was one of Norway’s leading tanker-owner at that time, was one of the few Norwegian shipowners who were running a profitable company. He operated in traditional manner, foregoing the freight rate peaks but securing a steady stream of income from long-term contracts. For others, revenues decreased due to lower freight rates and the value of the vessels could be reduced as much two-thirds due to overcapacity in the market.

When the market collapsed, so did a large part of the Norwegian shipping industry. Vessels in the spot-market were laid up, and the frequent renewal implied that the owners had many orders of new-buildings, which resulted in a lot of cancellation fees and some took delivery even though the ships were worth only a portion of the investment. The crisis forced many of the Norwegian shipping companies to bankruptcy, and naturally the number of companies in Norway and the size of the fleet was reduced. The main reason for this reduction was that too many of the owners had assumed activity and asset risks that were unsustainable when the market collapsed (Harlaftis, Tenold & Valdaliso, 2012).

The companies who had diversified and invested in new and innovative specialized vessels, such as car carriers, chemical tankers or gas carriers, were the ones who survived the crisis. In 1987 the Norwegian International Ship Register was, as previously mentioned, introduced and this further led to a considerable reduction of operating costs for vessels sailing with the Norwegian flag. In the following years, companies started to speculate in improved vessel values, which was partly a reason for the strong growth of the Norwegian fleet. Today, the majority of Norwegian shipping companies are involved in the market of specialized industrial shipping. One of their main competitive advantages is their reputation for solidity and competent handling of risk (Harlaftis, Tenold & Valdaliso, 2012). This shows that Norwegian companies have been able to learn from history, and develop into the highly sophisticated industry we see today.
Governmental Involvement
The maritime industry is one out of five industries which the Norwegian government has selected as strategic focus areas. The overall objective for industry- and trade policy in Norway is to maximize the overall value creation in the economy, and employment for all. (Stø Kurs 2020, 2013)

The government is actively working to ensure market access and a more predictable framework for export of goods, services and investments in the international maritime industry through negotiations in the World Trade Organisation (WTO), the EFTA free trade agreements and bilateral shipping agreements. Countries such as China, Korea, Japan, Brazil, Russia, USA, India and Singapore are particularly important for Norway in the maritime area.

Each year Norway promotes the maritime industry through large fairs, which gather an international audience. For instance, Nor-shipping offers several important promotion activities for the industry by creating a venue for conferences, seminars and networking. In 2013 the Nor-shipping fair was visited by 31,500 people from 80 different nations, and had 1037 exhibitors. In addition it is estimated that approximately 40,000 people attended the seminars and social activities related to Nor-shipping (www.messe.no). Promoting the maritime industries abroad has two major purposes. It supports Norwegian actors marketing efforts abroad, and it promotes Norway as a prospective host country for the international maritime industry (Stø Kurs 2020, 2013).

A large fleet sailing under the Norwegian flag is important for Norwegian influence in international regulatory forums. Therefore, the government is working to improve the attractiveness of the Norwegian flag-state. The goal is to be an attractive flag state with high security standards for life, health, environment and material assets (www.regjeringen.no).

One of the government’s objectives is that the Norwegian maritime industry will be the most environmentally friendly and lead in the development of new solutions. The government works towards establishing global requirements and mechanisms for reduction of greenhouse gas emissions from international shipping. In addition, the Norwegian government works to develop and enforce more strict security- and environmental standards that are not covered by international regulation. The government has a zero-vision regarding accidents at sea. Living up to this vision
involves significant use of public resources and investment. The vision require focused efforts from the industry themselves, and the public sector. It is enforced by regularly monitoring and controls. Results from this effort can already be seen. For instance, work and personal accidents has shown a significant decrease from approximately 1300 reported incidents in 2000 to roughly 200 in 2011 (Stø Kurs 2020, 2013).

There is also a large focus on research and innovation in Norway and the government has a goal for Norway to be the world leader in maritime research and innovation. When the strategy “Stø kurs” first was released in 2007, it was followed by a significant enhancement in the allocation to maritime research and innovation through the Norwegian Research Council and Innovation Norway.

The High North is the Norwegian government’s most important strategic priority in the maritime strategy “Stø Kurs 2020”. The overall goal is formulated as follows; “The government’s aim is for Norway to be world leading in efficient, safe and environmentally friendly maritime transport and innovative and value adding maritime business in the North” (Stø Kurs 2020, 2013: p.46). This implies that an overall goal is to facilitate value creation through commercial activity and safe shipping, while being responsible and taking account for environmental and climate concerns.

6.5.2 Porter’s National Diamond of Competitive Advantage

Norway is ranked as 11\textsuperscript{th} on the Global Competitiveness Index 2014-2015, which measure national competitiveness. This ranking is prepared by the World Economic Forum, and they define national competitiveness as the set of institutions, policies and factors that determine the level of productivity (www.weforum.org).

In this section we will use Porter’s framework for national advantage to analyze the factors that contributes to the Norwegian shipping industry’s competitiveness. We will further analyze whether or not the factors also have the ability to enable Norwegian shipping companies to succeed in operations along the NSR.
**Factor Conditions**

Looking at the history and development of the Norwegian maritime industry it is clear that it has derived considerable advantage from factor conditions like competent labor, knowledge resources, capital resources and natural resources. Some factors have been, and will continue to be more important than others. Sound resource utilization, meaning that resources are used where they create the most value, is highly important.

In line with theory (Helfat, 2007; Teece, 2007; Argote & Ingram, 2002), dynamic capabilities and knowledge have been especially important, and in relation to the new opportunity the NSR offers, the importance of dynamic capabilities and knowledge will be amplified. In the following we provide an overview of the factor conditions that has allowed Norway to compete in the international shipping industry. In addition, weaknesses in some of the factor conditions will be pointed out. Further, we offer a more comprehensive and in-depth analysis of the factor conditions that hold the potential to be the basis for competitive advantage; knowledge and dynamic capabilities.

**Labor resources**

Access to skilled labor is one of the factor conditions in Porter’s framework. Norway is a fairly small country, in 2012 Norway’s population passed 5 million, and today the population is about 5,1 million. The country has a well-organized education system, which assures free elementary- and high school, and possibilities for a higher education for everyone (www.snl.no). Because of this citizens are generally highly educated and one can argue that there is a large competent pool of labor in Norway.

The level of employment in Norway has risen strongly since the mid-1990s, and the current level of employment is high. The relative cost of Norwegian labor is also high; this is evident from a view of the hourly labor costs in the industry. For instance, a Norwegian industrial worker earns three times more than i.e. an industrial worker in South-Korea, which is a significant competitor in the shipbuilding market (Økt skipsfart i Polhavet, 2013).

Norwegian shipping companies operate in an international market where access to qualified labor at an international cost level is fundamental for the competitiveness of the companies within the
industry. Nowadays, it is common for Norwegian companies to recruit crew and officers from countries with considerably lower cost level than Norway (Konjunkturrapport, 2013). It is clear that from a cost-perspective this is a reasonable solution to overcome the cost-disadvantage Norwegian labor represents. However, we question whether this might harm the knowledge development in the industry. As mentioned earlier, seafarer’s experiences and knowledge, gathered through generations, has been the building-blocks behind the strong and competitive maritime nation we see today. Seafarers are the key transmitters of experience and expertise from sea to land, and between actors onshore. If the proportion of Norwegian seafarers in the Norwegian fleet continues to decrease, it could potentially decrease the experience-based knowledge we will find in Norway in the future.

The Norwegian labor market is tight and this is causing Norway difficulties in term of both access to skilled workers and high wage growth. Actually, eight out of ten shipping companies say they find it difficult to recruit Norwegian technical personnel (Konjunkturrapport, 2013). However, compared with other European countries, the recruitment to the maritime industry and maritime education has shown a positive trend in Norway in recent years (Stø Kurs 2020, 2013).

**Education**

A nation’s competitive success largely depends on the type of education its talented people choose (Porter, 1990). The trend in Norway shows that more and more people take higher education. In 2014 there are 261 200 Norwegian students enrolled in higher education, both in Norway and abroad. Furthermore, every third 19-24 year old person is enrolled in higher education (www.ssb.no).

In the maritime industry 35 per cent of the Norwegian workforce has a higher education degree. However, surprisingly 21 per cent of the Norwegian maritime industry’s workforce is unskilled. The remaining 44 per cent has a more practical educational background (Jakobsen, 2011). The share of unskilled and uneducated workforce is expected to decrease as there has been an increase in recruitment to maritime education in the recent years (Stø Kurs 2020, 2013).

Several different colleges and universities offer traditional maritime education in Norway. In addition, the Norwegian Navy offers maritime education and training programs.
(www.maritimkarriere.no). One can also find several degrees with maritime specialization in Norway; one example of this is a master degree in Technology and Safety in the High North at the University of Tromsø.

A specialized education system is important for renewal and innovation. In addition the structure of what the Norwegian education sector offers should be tailored to the current and future competence requirements of the Norwegian industries, including the maritime industry. For instance, the Norwegian maritime sector faces an increasing demand for skilled employees, such as engineers. The current situation presents a huge demand for labor with scientific or technical background, and not enough qualified people. In fact, Norway ranks below the OECD average for the proportion of students taking mathematical, scientific and technology courses in higher education (Konjunkturrapport, 2013). To manage this challenge the Norwegian Ministry of Education has launched a strategy “Science subjects for the future” which is a strategy aimed at strengthening science and technology knowledge in Norway, and encouraging recruitment on all levels. The strategy contains a number of initiatives, all the way from kindergarten to higher education and research institutions. One can already see some promising results, for instance, there has been a major increase in enrolment in engineering degrees (Stø Kurs 2020, 2013).

To promote cooperation between higher education institutions and the industry, and to ensure that students receive education that is relevant for the labor market, the government has additionally decided that all educational institutions should have a council for cooperation with industry partners (Stø Kurs 2020, 2013). This will further strengthen the compliance between education and industry requirements for the future.

Development of Arctic maritime competencies and education of personnel is very important in relation to the future opportunities the NSR offers. Norway has a high level of expertise when it comes to sailing in polar waters, and today there are various educational and training programs for seafarers related to operation of ships in polar waters, i.e. the master degree in Technology and Safety in the High North at the University of Tromsø. It is important to maintain and further develop Arctic maritime educational programs. Norway could have the basis to become a world leader in training and educating seafarers for operations in polar waters.
Knowledge Resources
The creation and assimilation of knowledge has received more and more attention as the basis for competitiveness. In nearly every successful industry leading companies create specialized factors such as knowledge (Porter, 1990).

Knowledge resources have high importance in Norway in general, and it can be argued that it greatly have contributed to the competitiveness of companies within the nation. The Norwegian maritime industry has demonstrated its ability to create a world-leading knowledge based maritime cluster characterized by a unique ability to innovate and create value (www.rederi.no). Strong interdependencies between actors in the various parts of the maritime sector and the emphasis on innovation have historically contributed to a strong and dynamic industry (Benito et al., 2003). Furthermore, Norwegian universities, colleges and other research institutes are among the best within maritime research. The Norwegian shipping industry has long recognized the importance of knowledge development and research in combination with experiential expertise (Økt skipsfart i Polhavet, 2013).

For Norwegian shipping companies to keep their global competitive position they need to excel at both knowledge and innovation. In addition, for Norwegian companies to be able to evaluate and take advantage of the opportunities the NSR offer, further knowledge development and transfer is needed. To do this they need to focus on knowledge development and the transfer of knowledge between the different actors within the industry.

What is evident from literature search and our analysis is that there actually resides extensive knowledge concerning maritime operations in the Arctic, in Norway. For instance one of the main research areas of the Fridtjof Nansen Institute is Arctic and Russian politics (www.fni.no). Additionally, the arena project “Arctic maritime cluster” is a specialized Arctic cluster that encourages increased innovation and works towards strengthened competitiveness based on cooperation between companies, knowledge institutions and public development agencies. Contribution from the government in the form of public founding is important in the work toward improving the level of knowledge about maritime operations in the Arctic. Demanding and intense operations in the region is one of the main topics on the agenda in the government funded MAROFF program, an innovation program for research and knowledge development in the maritime sector in Norway (Stø Kurs 2020, 2013).
The results from our survey show that 38.7 per cent of the companies agrees or strongly agrees to the statement “our company has a high level of knowledge concerning shipping in the Arctic Region”, while 29 per cent disagrees. This indicates that the shipping companies in Norway have some level of knowledge on the subject. However, the situation is worse in relation to knowledge about the NRS. Only 19.35 per cent agrees or strongly agrees that they have a high level of knowledge concerning the NSR, while as much as 45.16 per cent disagrees or strongly disagrees. Pierre Cariou also expressed his concern in relation to the level of knowledge of the NSR in the industry in general. He explains that companies currently do not have sufficient knowledge, and argues that this can be seen in relation to the level of risk associated with the route. Companies have not been willing to invest in knowledge concerning something they see as highly risky.

In relation to the important role knowledge has played for the Norwegian companies’ previous success, and is likely to play in the future, we argue that the current level of knowledge is insufficient for the companies to succeed in operations along the NSR.

Even though there are highly knowledgeable actors and institutions within the industry, for shipping companies to be able to benefit from it, the knowledge has to be transferred. Knowledge transfer can however, be challenging due to its tacit nature. Explicit knowledge can be codified, and easily transferred, but tacit knowledge implies that the knowledge is linked to the individual and hard to articulate (Polanyi, 1967).

Absorptive capacity will help companies recognize external information, integrate and apply it. Norwegian shipping companies have a broad prior knowledge base and diversity of experience, which according to Cohen and Levinthal (1990) increase a firm’s absorptive capacity. Additionally, for the external information to be integrated and learned there are some measures that could be taken. For instance Brown and Duguid (1991) argue that real work experience and collaboration in joint work ease the acquisition of new knowledge. Norwegian shipping companies could collaborate with institutions and other research facilities that hold the knowledge they need. For the collaboration to be most fruitful participants from companies and other institutions could for instance participate in joint workshops. When people meet and partake in conversations and joint work knowledge is seen in context and the transfer process is eased (Brown and Duguid, 1991).
Reagans and McEvily (2003) further argue that cohesion around a relationship and network range can ease the transfer of knowledge. The strong interdependencies between actors in the various parts of the maritime industry in Norway can be an indication of cohesion. As will be evident from the section on supporting and related industries, there is an extensive network range in the maritime industry in Norway. These are characteristics and qualities in the industry that will facilitate knowledge transfer, and allow Norwegian companies to increase their level of knowledge sufficiently to be able to take advantage of opportunities in relation to the NSR.

Knowledge sharing and development of knowledge is not only important within the shipping industry in Norway. International collaboration on research is important, and Norway must have sufficient ability both to participate in and capturing research conducted outside of Norway. Any future development of, for instance, the shipping infrastructure and safety of navigation along the NSR would benefit greatly from close collaboration and sharing of available knowledge and information between all the eight Arctic states and various stakeholders. For example, Russian’s 80 years of experience in operating icebreakers (www.2012.atomexpo.ru) should be shared. However, it is questionable whether this can be achieved due to political tension, and Russian’s current monopoly position in operating icebreakers along the NSR. The Russian authorities are not likely to give up this position as they are economically benefiting from it.

**Dynamic capabilities**

As the shipping industry is highly volatile and dynamic, for companies to survive they need to be able to handle changes in the industry (Stopford, 2009). Hence, unique dynamic capabilities rather than the possession of valuable, rare, inimitable and organizational resources and capabilities are what enable companies to sustain their competitiveness. The Norwegian shipping industry has repeatedly shown its ability to sustain its competitiveness in situations of change. Norwegian companies have been quick to adapt to rapidly changing environments, while they themselves have helped to create change (Stø Kurs 2020, 2013). As the industry has changed over the years, companies have been faced with new opportunities. Norwegian companies have shown its ability to extend and modify their resource base, and create new resources. This is, for instance, evident in the high level of specialization we find in the Norwegian shipping industry. What is clear from this is that the companies within the industry have dynamic capabilities.
Natural resources represent one of the factor conditions that have enabled Norway to compete in the shipping industry. Oil, gas and fish can be mentioned as the most important natural resources in Norway, both in a general economic perspective, and also as an enabler for success in the shipping industry.

The Norwegian economy is largely based on the exploitation of natural resources, such as oil, gas, hydropower, and fish. Today, between 60-70 per cent of Norwegian export is natural resource based. Norway’s main mineral resources are petroleum and natural gas, which have been extracted from the large reserves in the North Sea. Additionally, the fishing industry in Norway has a long history, and Norway is today a world leader in the export of seafood (www.regjeringen.no). Historically, Norway’s most important trading partner has been within the EU, but in recent years the trend has been an increase in trade with other parts of the world, especially with Asian countries. Oil, gas and fish have been the main source of export (www.wto.org). The fact that Norway exports large amounts of these natural resources has created business opportunities for the Norwegian shipping industry.

Furthermore, a common denominator for these natural resources is the sea. Norwegian seafarer’s knowledge and competencies have historically been acquired through fishing, shipping activities, and in more recent time through advanced offshore activities, the common denominator been sea-activity (www.maritimkarriere.no). It can therefore be argued that the existence of natural resources has strengthened Norway’s maritime competencies across industries.

Natural resources have also been one of the main reasons for the development of the current level of Arctic competencies in the Norwegian maritime industry. As there are projections showing large amounts of gas and oil reserves in the Arctic region (www.naturvernforbundet.no), the Norwegian offshore and shipping industry have started develop competencies in relation to operations under challenging Arctic conditions.
Infrastructure

Another factor condition in the framework is infrastructure. A functional and efficient infrastructure is highly important for value creation in Norway. Cheap and efficient transport is vital for economic growth. The infrastructure binds the country together and it links Norway to the rest of the world. The efficiency of the infrastructure is also highly important for the various industries competitiveness in relation to other global actors.

Norway differs from the rest of Europe with their special geography and topography. Norway has one of the longest coastlines in the world, and large parts of the country are surrounded by mountains. In addition, the country has a low population density and the business industry is largely scattered. Therefore, the distance is large, both domestically and internationally. Scattered industries and large geographical distance makes transportation and costs related to logistics higher than if you compare it with other countries. Therefore, it has always been important for Norway to have an effective transport system that can reduce the costs of transportation (www.regjeringen.no). To the extent that distance leads to higher costs and hamper cluster productivity, this could constitute a disadvantage for the Norwegian shipping industry. However, such characteristics would normally be labeled as unfavorable, but the challenges related to the geography of the country has led the nation in a quest for better solutions, and this has benefited the shipping industry as transportation by sea has been the preferred choice.

Maritime infrastructure is traditionally linked to ports and shipping lanes, but it also includes logistics, connections between ports and other parts of the transportation system and integrated coastal zone planning. Taking Norway’s extensive coastline into account it can be argued that it represents a major advantage in relation to shipping activities. The long coastline has always been central in the development of the country’s infrastructure. In the Norwegian transport plan—Nasjonens transportplan 2010-2019—the government highly emphasizes the importance of transport by sea (www.regjeringen.no).

Demand Conditions

Compared to other countries in the world, Norway is relatively small. Norway has approximately 5.15 million inhabitants and accounts for only 0.07 per cent of the world’s population. Norway’s GDP was $515.8 billion in 2013, which gives a GDP per capita (PPP) of $55,400. This means that
Norway has the 11th highest GDP per capita (PPP) in the world (www.civ.gov). With that information in combination with the above mentioned high education level in Norway, we can define the Norwegians as sophisticated buyers, which Porter states will result in competitive advantage due to sophisticated buyers ability to force and pressure companies to meet demanding needs, high standards, to innovate and upgrade. Two industries in Norway, which demand highly sophisticated shipping services are the oil and gas and fishing industries. The transportation of these types of products requires sophisticated and highly specialized vessels. This shows that the Norwegian maritime industry has shown an ability to meet new and sophisticated demand conditions. Arctic opportunities in relation to the oil and gas industry, has already created new demand conditions for the shipping industry. Shipping companies offering offshore support services and supporting industries have already started to adapt to these demands by developing new technologies and gather important information. This implies that demand conditions has represented an important part of the current level of Arctic knowledge in the industry.

**Related and Supporting Industries**

As mentioned, Norway has been a key player in the global maritime industry for many years. Norway has the control over one of the world’s largest merchant fleets. In addition, they are the only country that has a complete maritime cluster. They have numerous and varied maritime activities that have grown up around traditional shipping operations, with solid and often leading position in the international market. Norway’s goal is to be one of the world’s leading maritime nations and a supplier of the most innovative and environmentally friendly solutions. The Norwegian maritime industry includes leading shipping companies, shipbuilding yards, equipment manufacturers, ship designers, service providers, maritime education and universities, maritime IT, maritime R&D, and regulatory bodies. The maritime industry is really strong in Norway and accounted for 5.5 per cent of Norway’s GDP in 2009. After oil and gas, the Norwegian maritime industry as a whole, is the second largest export industry in the country (www.norway.gr).

The case of Norway is really in line with Porter’s beliefs. He states that suppliers and related industries are important for innovation and internationalization in an industry, and he also emphasizes the ability to coordinate or share knowledge between the related industries. As Trond Giske, formal Norwegian Minister of Trade and Industry said, “*The strength of the Norwegian maritime cluster is its ability to apply international regulations as well as the outcome of R&D for innovation in products and services for the benefit of global shipping. This is a result of*
cooperation between various sub-sectors in the industry. Our comprehensive maritime policies prioritize forward-looking engagements and initiatives”. He further states that the new markets that is about to emerge in Arctic Waters will not be a problem for the maritime industry in Norway, but rather bring opportunities for further development of Norwegian competencies, as well as innovation (www.nmi2011). Below you find a figure that illustrates the Norwegian shipping and maritime industry clusters. All clusters in the figure interact with each other—sharing knowledge, developing new products, sharing experiences and innovations.

Figure 12: Norwegian shipping industry clusters

During spring 2013, The Norwegian arena-project “Arctic maritime cluster” was established. The purpose of the project is to encourage increased innovation and to strengthen competitiveness based on cooperation between companies, knowledge institutions and public development agencies. The clusters vision is to hold a position as the leading maritime knowledge and industrial environment in Norway related to Arctic challenges. The cluster is working on developing equipment, design and processes that will enable effective, safe and environmentally robust maritime operations in the Arctic. In the cluster one can find representatives from all levels of the value chain in the maritime industry, from shipowners and knowledge providers to shipyards and service and equipment suppliers (Stø kurs, 2013).
Firm strategy, structure and rivalry

In Norway, public ownership is almost absent in the shipping industry. Almost every shipping company in Norway is privately owned (www.regjeringen.no). Traditionally, Norwegian private owners have dominated the whole maritime industry in Norway, but in recent years ownership has increasingly become foreign. This is due to acquisitions or because foreign multinational businesses has seen Norway as a highly attractive country to establish operations within the maritime industry (www.rederi.no).

Furthermore, because of the large number of actors and variety in the shipping industry in Norway the industry can be seen as very active. One of the key reasons for the successes in the Norwegian shipping industry is that the industry is founded upon teamwork between each of the internationally competitive sectors that are included in the maritime cluster (Hammer, 2000).

The Norwegian industry is characterized by a large number of shipping companies, varying in size and scope (www.rederi.no). This indicates a high level of rivalry within the industry in Norway. However, because of the characteristics of the shipping industry and its inherently international nature, it is important to emphasize that rivalry in this industry should not only be considered at the national level. Hence, Norwegian shipping companies compete for the same customers as international companies, and therefore the whole Norwegian shipping industry plays an important role in ensuring that the industry is at its best competitive edge.

In Norway, like other Scandinavian countries, business culture is recognized as extremely non-hierarchical. This implies that emphasis in Norwegian companies is not on the hierarchy of peoples relationships but more on practicality and the development of efficient systems that allow people to perform their task effectively. Furthermore, there is an openness of communication and freedom of information. The flat organizational structure also implies that management is considered equals and act more as coaches and facilitators than as authority figures (www.worldbusinessculture.com). This type of organizational structure encourages cooperation and knowledge sharing, and it is clear that this has positively affected the Norwegian shipping industry. Furthermore, we argue that the characteristics of Norwegian organizational structure can be an advantage in relation to the development of knowledge and competencies required for shipping along the NSR.
7. Concluding remarks

During this thesis we have analyzed the attractiveness of the Northern Sea Route, and it is clear that the route offers some benefits, however the many challenges identified are likely to outweigh the benefits, at least in the short term. Even though, the challenges currently outweigh the benefits, the future might be different, and some of the challenges presented in the analysis, are likely to decrease in the future.

This is in line with the results from our survey, which clearly show that Norwegian shipping companies believe there is a future potential for the Northern Sea Route to become viable. Only 16.13 per cent of the surveyed companies do not believe in the viability of the route. The future attractiveness of the route is however highly dependent on the development of circumstances beyond the shipping industry’s control, i.e. climate conditions.

It is evident from our analysis that the Northern Sea Route has the potential to offer shipping companies benefits such as shorter sailing distance, potential time and cost savings, less fuel consumption, reduced emissions and no piracy threats. At a quick glance these benefits might seem highly attractive, however they must be weighed against the many challenges that operations along the NSR currently will impose on companies.

The presence of these challenges implies that Norwegian shipping companies have the luxury of time to prepare for future opportunities. This is highly advantageous, as our analysis demonstrates that Norwegian shipping companies currently do not have sufficient knowledge concerning operations along the Northern Sea Route. What is evident however is that the necessary knowledge exists within the Norwegian maritime cluster, and Norwegian shipping companies are well positioned to be able to benefit from this. What is crucial is for the knowledge to be transferred between the different sectors. Strong cohesion around relationships and network range will ease this knowledge transfer.

We started out with the following research question: Is the Northern Sea Route a viable option? And, how can the Norwegian shipping industry best position itself to take advantage of the potential opportunities this will offer? Our conclusion is that the Northern Sea Route currently is not a viable
option; however it is likely to be a viable option in the future. Accordingly, the Norwegian shipping industry should acquire the necessary knowledge and expertise through close collaboration with knowledgeable representatives from the maritime cluster in Norway. The Norwegian shipping industry is well positioned to be able to benefit from the highly knowledge intensive cluster they are a part of. The companies could collaborate with institutions and other research facilities, such as the MAROFF program, the Fridtjof Nansen Institute and the University of Tromsø. These are all representatives within the cluster, which possess Arctic competencies and knowledge the shipping companies need to prepare for future sailing via the Northern Sea Route. For the collaboration to be most fruitful participants from companies and other institutions could for instance participate in joint workshops. When people meet and partake in conversations and joint work knowledge is seen in context and the transfer process is eased. This will further enable the Norwegian shipping industry to be well prepared if and when the route becomes more viable.
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9. Appendices

Appendix 1. Questionnaire design

Estimated time to complete the survey is 4-5 minutes.

Global warming is causing Arctic seas ice to melt and previously ice-covered seas are now opening up for commercial navigation. Accordingly shipping companies all over the globe have started to consider the potential to find shorter sea routes between Europe and Asia. 74 vessels sailed through the Northern Sea Route in 2011, compared to 46 in 2010, which indicates that the use of the route already has become more attractive.

This survey is part of the data collection for our master thesis at Copenhagen Business School. The aim of the survey is to identify Norwegian shipping company’s intentions regarding the use of The Northern Sea Route.

Thank you for participating.

Northern Sea Route

1. Company name:

2. Number of vessels operated by your company:

3. Sector of activity:
   - Container
   - Bulk
   - Tanker
   - RoRo
   - General Cargo
   - Special Project
   - Other (please specify)

Next
Northern Sea Route

4. Please evaluate the following statement:
   Our company has a high level of knowledge concerning shipping in the Arctic Region.
   - Strongly disagree
   - Disagree
   - Neither agree nor disagree
   - Agree
   - Strongly agree

5. Please evaluate the following statement:
   Our company has a high level of knowledge concerning The Northern Sea Route.
   - Strongly disagree
   - Disagree
   - Neither agree nor disagree
   - Agree
   - Strongly agree

6. Do you believe the Northern Sea Route holds the potential to become a viable option to the Suez Canal for shipping between Europe and Asia?
   - Yes
   - No
   - In 10-15 years
   - In 20-30 years
   - In more than 30 years

7. Has your company, to your knowledge, considered using the Northern Sea Route as an alternative route between Europe and Asia?
   - Yes
   - No
   - I don't know
Northern Sea Route

8. What do you consider the main benefits for shipping via the Northern Sea Route?

9. What do you consider the main challenges/obstacles for shipping via the Northern Sea Route?

10. Should the Norwegian government and the Norwegian shipping industry assume an active role in developing the Northern Sea Route for commercial navigation?

   - Yes
   - No
   - I don't know
   - Why/Why not?

   Why/Why not?
## Northern Sea Route

### 11. Is your company considering the use of the Northern Sea Route in the future?

- [ ] Yes
- [ ] No
- [ ] I don’t know

Why? Why not?
Appendix 2. Interview guide Pierre Cariou

<table>
<thead>
<tr>
<th>Research question</th>
<th>Interview question</th>
<th>Follow-up question</th>
<th>Theories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Who is Pierre Cariou?</td>
<td>Can you tell us a bit about your background?</td>
<td>- Education and career</td>
<td>- Fields of interest and knowledge</td>
</tr>
<tr>
<td>How is the shipping industry today?</td>
<td>How would you characterize the shipping industry today?</td>
<td>Trends, markets</td>
<td>Shipping economics</td>
</tr>
<tr>
<td>Arctic shipping opportunities</td>
<td>The Arctic has received considerable attention the last years and is of high importance on the international policy agenda. What are your thoughts on the subject?</td>
<td></td>
<td>Change</td>
</tr>
<tr>
<td>Is there potential for the Northern Sea Route?</td>
<td>Do you believe the Northern Sea Rout holds the potential to become a viable option to the Suez canal for shipping between Europe – Asia?</td>
<td>Why / why not? Timeline</td>
<td>Industry Competitiveness</td>
</tr>
<tr>
<td>What do you consider the main benefits related to shipping via the Northern Sea Route?</td>
<td>How about emissions? Do you believe emissions can be reduced by using the NSR instead for the Suez canal?</td>
<td></td>
<td>Macro environmental factors</td>
</tr>
<tr>
<td>What are the risks associated with the NSR?</td>
<td>What do you consider the main risks related to shipping via the Northern Sea Route, and how can these risks best be handled?</td>
<td>Environmental concerns?</td>
<td>Macro environmental factors</td>
</tr>
<tr>
<td>Whose responsible for the NSR?</td>
<td>Who do you think should be responsible for the development of the route?</td>
<td>Infrastructure</td>
<td>Risk</td>
</tr>
<tr>
<td>How is the knowledge level? Is there a knowledge sharing culture in the shipping industry?</td>
<td>Do you believe the shipping industry have sufficient knowledge about the NSR?</td>
<td>Would you say there is a willingness to cooperate and share knowledge between companies, and between companies and public institutions in the shipping industry?</td>
<td>RBV &amp; Knowledge based view</td>
</tr>
</tbody>
</table>
Appendix 3. List of Companies invited to participate in questionnaire

Companies who were asked to participate and participated:

- Scanshipping
- Wilson ASA
- Jebsens
- Viken Shipping
- Wilhelmsen Ship Service
- Berge Rederi
- Frontline
- Fred. Olsen & Co
- Grieg Shipping
- J.J Ugland Companies
- Kristian Gerhard Jebsen Skipsrederi
- Larvik Shipping
- Nor Lines AS
- Spar Shipping
- Sogne Blystad AS
- Ivaran Rederi
- Simon Møkster Shipping
- Tschudi Shipping Company AS
- Bryggen Shipping & Co
- Offshore Heavy Transport
- The Torvald Klavenes Group
- Norgas – Skaugen
• Sea Cargo
• Solvang Shipping
• Knutsen Oas

Companies who were asked to participate but did not participate:

• Utkilen
• Westfal Larsen Shipping AS
• Vaage Ship Management
• Arriva Shipping
• Belships ASA
• JO Tankers
• Misje Rederi AS
• Mowinckels Rederi
• Odfjell Tankers AS
• Odfjell GAS
• Eide-Gruppen
• Green Reefers
• Hagland
• Kopervik Group
• Nomandic
• Aasen Shipping
• Norwegian Car Carriers
• Western Bulk
• Skaugen
• Bergshav Management
• Mikkal Myklebusthaug
• Saga Forrest Carriers
• Hav Ship Management