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ABSTRACT

Abstract

Companies located in a maritime cluster have all their own networks that are comprised of various stakeholders. Nevertheless, the recent studies about maritime clusters have highlighted the importance of external networks that reach outside the cluster. The maritime industry is continuously developing and so must the maritime companies if they want to remain competitive. The purpose of this study was to investigate what relationships companies have to other companies and stakeholders. The main research object of this study was *how companies in maritime clusters are networked*. This study focused on describing and understanding these networks. To comprehend these networks better, it is important to understand how different maritime companies perceive their collaborative actions, what goals do they have, and how they see the future needs.

In this study, the participants were selected based on their involvement in One Sea project. One Sea project suited well as a framework for participant selection because the involved companies represent different sectors in maritime business and therefore, it can give a better view of the maritime industry. The research data in this study was gathered from semi-structured interviews. The findings mostly aligned with theory as similarities to the previous research findings were found. Also, the findings suggest that digitalization and new technologies are promoting new forms of cooperation.

The findings identified that companies in maritime clusters seem to be networked in multiple sectors. The networks consisted of both local and global partners. Companies' reasons for cooperation can be based on common interests, new knowledge or resources. However, potential new partners must meet certain requirements. Even direct competitors can cooperate if their interests are aligned. It can be seen that the developing requirements of maritime industry seem to be promoting the formation of new networks and partnerships that match the future needs. This will highlight the importance of networks with the right capabilities in the future.

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Tiivistelmä

Meriklusterissa sijaitsevilla yrityksillä on kaikilla omat verkostonsa, jotka muodostuvat erilaisista sidosryhmistä. Siitä huolimatta viimeaikaiset tutkimukset meriklustereista ovat tähdentäneet ulkoisten verkostojen tärkeyttä, jotka ulottuvat klusterin ulkopuolelle. Meriteollisuus kehittyy jatkuvasti ja niin täytyy myös merialan yritysten, jos ne haluavat pysyä kilpailukykyisenä. Tämän tutkimuksen tarkoituksena oli tutkia millaisia suhteita yrityksillä on muihin yrityksiin ja sidosryhmiin. Tämän tutkimuksen päätutkimuskysymys oli *miten yritykset meriklusterissa ovat verkostoituneet*. Tämä tutkimus keskittyi kuvaamaan ja ymmärtämään näitä verkostoja. Käsittääkseen näitä verkostoja paremmin on tärkeää myös ymmärtää miten eri merialan yritykset mieltävät yhteistyökuvionsa, mitä tavoitteita yrityksillä on ja miten yritykset näkevät tulevat merialan tarpeet.

Tässä tutkimuksessa haastateltavat valittiin heidän osallistumisensa perusteella One Sea -hankkeeseen. One Sea -hanke sopi hyvin kehykseksi haastateltavien valintaan, sillä siihen osallistuvat yritykset edustavat meriteollisuuden eri aloja. Tämä mahdollistaa laajemman näkemyksen merialan yrityksiin. Tutkimusaineisto kerättiin tässä tutkimuksessa teemahaastatteluista. Tehdyt havainnot olivat enimmäkseen yhdenmukaisia teorian kanssa, sillä yhtäläisyyksiä löytyi aiempiin tutkimushavaintoihin. Havaintojen perusteella voidaan myös todeta, että digitalisointi ja uudet teknologiat edistävät uusia yhteystyömuotoja.

Havainnoista oli tunnistettavissa, että yritykset meriklusterissa ovat verkostoituneet useilla eri sektoreilla. Verkostot koostuivat sekä paikallisista että globaaleista kumppaneista. Yritysten syyt yhteistyöhön perustuvat yhteisiin intresseihin, uuteen tietoon tai resursseihin. Uusien potentiaalisten kumppanien täytyy myös vastata tiettyjä kriteereitä. Jopa suorat kilpailijat voivat tehdä yhteistyötä jos niiden intressit kohtaavat. Voidaan myös todeta, että meriteollisuuden kehittyvät vaatimukset näyttävät edistävän uusien verkostojen ja kumppanuuksien muodostumista vastaamaan tulevaisuuden tarpeisiin. Tämä tulee korostamaan tulevaisuudessa oikeanlaisten verkostojen tärkeyttä.

Asiasanat	Meriklusterit, verkostot, meriteollisuus
Muita tietoja	

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COMPANY NETWORKS IN MARITIME CLUSTERS

Case One Sea

Master´s Thesis
in International Business

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1   INTRODUCTION

1.1   Background of the study

Many scholars have sought to understand why companies tend concentrate in certain locations and what are the reasons for such activities. Such reasons have varied from being in a close proximity to markets or to minimize costs. Such industrial agglomerations are called clusters. (Porter 2000, 21.) Clusters are also often referred to networks of interconnected companies (Connell, Kriz & Thorpe 2014, 138). So, the two concepts, clusters and networks, are closely bound to each other. To elaborate, Günther and Meissner (2017, 503) have stated that "Clusters are typically formally organized networks in different forms". Those forms can vary from formal to loosely tied connections. Moreover, companies that are close to each other, especially inside clusters, can gain additional advantages if they become network partners. In addition, the geographic proximity can make it easier to build such cooperative relationships. (Niu, Miles & Lee 2008, 179.)

In the past, shipping revolutionized the way we can move goods and people from one place to another. Since sipping was invented it has played a vital role in the global trade. (Pascali 2017, 2828.) In addition, more than 90 percent of all goods are being transported via sea routes (Ducruet 2016, 3). Besides that, for centuries several maritime activities have clustered close to each other in spaces that we are calling today maritime clusters. Moreover, there is even evidence that most of the maritime clusters have originally formed from and around port activities. Many maritime activities are also connected either directly or indirectly such as shipping, shipbuilding, ports and maritime services. More importantly, the concentrations of such activities in clusters seem to be increasing especially in the maritime industry. (De Langen 2002, 209; Zhang 2013, 162.)

The 21st century is an era of digitalization and new innovations have opened new possibilities also in maritime industry. These new innovative solutions require cooperation beyond the traditional industry boundaries. (Rutkowski 2016, 627–628.) So, it is important to understand how maritime companies are networked. It can be seen that the maritime industry is on the brink of change where digitalization and automated solutions will require skills of a totally new kind and competencies (The Maritime Executive). And yet, it is partly unclear what such skills and competencies might actually be in the near future. To reduce the uncertainty of future needs, companies seek to form collaborative relationships with the most suitable partners. Moreover, what the companies look in partners are complementary competencies and skills that could enhance their business and broaden their knowledge. (Solesvik & Encheva 2010, 712.)

The industry settings can have an influence on the structure of a network (Kogut 2000, 411). Can traditionally an inward-looking maritime industry change to a more open

knowledge sharing community that can co-create new innovative solutions together? What possible reasons companies could have for cooperation and what do they believe to achieve from it? According to Munksgaard (2015, 287) it is also important to understand the interests and goals of other network members because every member of a network can perceive the collective goal somewhat differently. Besides the collective goal, usually every company also have their own agenda. So, it is interesting to see how different maritime companies perceive their collaborative actions and what goals do they have.

Another essential point is that many companies can be connected to multiple networks instead of just one network. The purpose for this is to reduce their dependency of a specific network. In the same way, the companies become more aware of the resources that other networks can provide. So, the decision of staying in such cooperative agreement can depend on how well the current network manages in comparison to the other alternative networks. (Klein & Perreira 2016, 162.) In other words, if companies focus only on networks in their own cluster, they might miss potential opportunities outside the cluster. Therefore, companies should build relationships to partners also in other networks. This would be essential for the growth of the cluster as the relationships to partners outside the cluster could bring new knowledge and expertise into the cluster. More importantly, that could enhance the whole cluster's innovativeness and create additional value adding activities. (Niu et al. 2008, 179, 187.) In addition to cooperation between companies, it will be interesting to see what kind of relationships companies have to institutions like universities. Universities and other research institutions can play a vital role in the cluster development because they can produce new knowledge. Moreover, such institutions can train a new skilled workforce according to the companies' needs. (Benito, Berger, De La Forest & Shum 2003, 211.)

As the maritime industry, especially shipping, is very regulated by various legislation, it is obvious that many maritime companies want to be involved in the process of new regulations (International Chamber of Shipping). Clusters, for instance, can increase companies influence power over authorities. To elaborate, the more companies work together on a common goal, the more likely they can have an influence on it. (Patti 2006, 270.) That aside, it has been identified that companies' reasons for cooperation in maritime industry change over time. Additionally, some of the motives can be linked to the cyclical nature of the maritime industry but generally the collaborative activities can be seen to provide some form of competitive advantage. (Solesvik & Westhead 2010, 841, 856.)

1.2   Purpose and structure of the study

The purpose of this study is to investigate *how companies in maritime clusters are networked?* This study examines the relationships that maritime companies have with other

actors in maritime clusters. To understand these relationships better it is important to examine their networks to gain deeper understanding of the phenomenon. The sub-objectives are as follows:

- How are companies and stakeholders networked?
- Why are networks relevant for maritime cluster companies?
- What kind of know-how maritime clusters should contain in the future?

The study focuses on understanding what kind of relationships and networks maritime companies may have. The first sub-objective gathers information about existing relationships between companies and stakeholders. The second sub-objective seeks to understand why networks are relevant. The third sub-objective investigates the potential future needs in maritime clusters.

The structure of the study is as follows: after the introduction, the theoretical framework is presented in Chapter 2. Firstly, the common cluster theories are introduced which is followed by focusing on the advantages and disadvantages of clusters. Secondly, the network theory presents networks from several aspects. Lastly, the maritime clusters conjoin the two different theories by presenting their relevance in maritime clusters. Chapter 3 introduces the research design, context and methodology. Also, it will explain how the data was collected and analyzed. Furthermore, the evaluation of the study is presented and discussed. Chapter 4 follows the same order as the research questions and presents the findings of this study. Conclusions are presented in Chapter 5 which consists of both theoretical and managerial implications and it examines the limitations of the study. Also, future research opportunities are presented and discussed. Finally, Chapter 6 summarizes the study and the main conclusions.

2 THEORETICAL FRAMEWORK

2.1 Cluster theory

Today's global economy is driven by competition that exploits fast transportation, high-speed communication and access to markets all around the world. However, the importance of location has not been diminishing during this time as location can be a key to competitive advantage. (Porter 1998a, 90.) During the last couple decades, there has been a growing interest in the phenomenon of organizations and firms that tend to agglomerate geographically in certain locations. The localized growth in the spatial economy is not a new phenomenon and many scholars have tried to understand the reasons for such activities. (Gordon & McCann 2000, 513.)

Alfred Marshall (1952, 222–231) was one of the first ones to point out the reasons why industrial activity tends to concentrate on certain areas. According to him, this was caused because of the physical conditions and the demand for skilled workmen. These agglomerations of firms and organizations are also called clusters. There are many definitions for a cluster as the concept of a cluster can vary based on how strictly it is defined. Porter (2000, 16) has defined cluster as "a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities". Moreover, he points out that such clusters have existed already for centuries as the concentrations of trade and companies in various industries. Similarly, McCann and Folta (2008, 533) suggested that cluster could be simply defined as "a spatial concentration of related firms". Additionally, Aziz and Norhashim (2008, 365) have argued that defining a cluster only within industrial sectors can be problematic because clusters tend to include several industrial sectors and it is challenging to draw clear lines on what actors actually are part of a cluster.

Nowadays, clusters consist of various actors such as business units, organizations and service providers which compete but also cooperate. These actors are located close to each other and are greatly linked to the core of the cluster. The core activity of a cluster consists of a specific economic specialization that is the driving force of a cluster. (De Langen 2002, 210.) A cluster population is not limited to these actors only as universities and research institutions play a vital role in providing specialized labor force to enhance human and technological capital of a cluster. Besides, a cluster can be seen as a network of interconnected actors. (Carrie 2000, 290.)

Firms tend to settle close to each other because of the locational economies. Clusters exist because they can give competitive advantage to firms operating in it. Firms can gain cost savings by accessing or exchanging products, services and knowledge between firms. This helps also to monitor and imitate competitors without close interaction. (Maskell

2001, 926, 930.) Location has been important for competition for generations, but its role differs greatly in today's business. Cheap labor, materials and input costs used to be major factors in determination of business location that could provide competitive advantage. Today firms can mitigate many of these disadvantages through global sourcing and location does not play similar role what it used play. Productivity is the key factor to competitive advantage which requires the more efficient use of inputs and continuous innovation. (Porter 1998a, 78.)

According to Porter (1990, 71–127) there are four different determinants of competitive advantage: (1) factor conditions, (2) demand conditions, (3) related and supporting industries and (4) firm strategy, structure and rivalry. In addition, there are two other factors that have influence on these determinants: chance and government. Figure 1 presents Porter's determinants of competitive advantage.
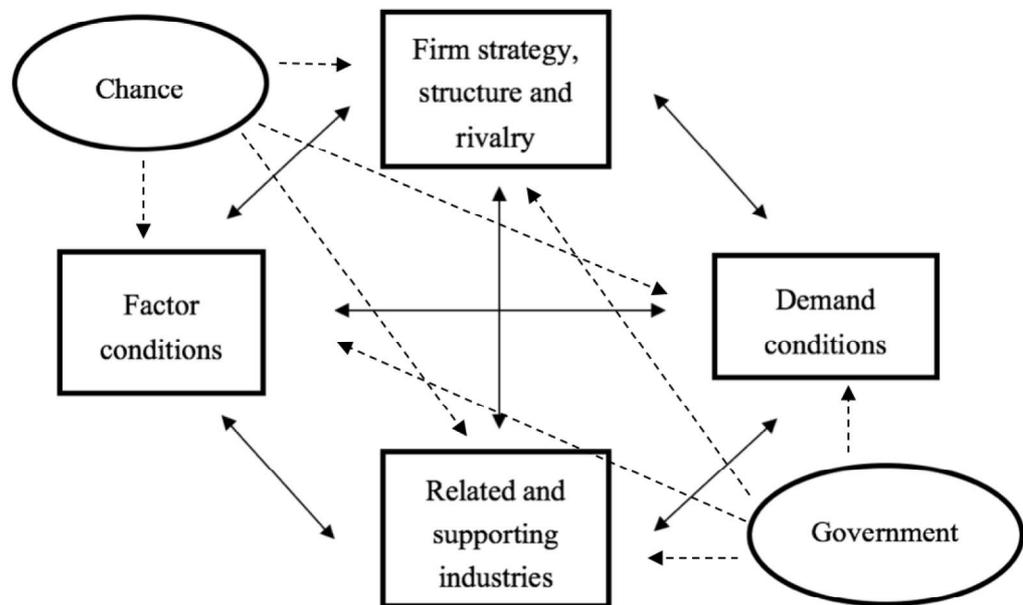
Figure 1   Determinants of competitive advantage (Porter 1990, 127)

Together these determinants form a reinforcing "diamond" system where each determinant is interdependent with each other. The strength of an industrial cluster is based on how interconnected these determinants are. Therefore, the competitive advantage is based on the self-reinforcing benefits inside a cluster that are hard for the outside competitors to replicate.

Aziz and Norhashim (2008, 365, 372) have argued in their study that there are two major flaws in Porter's diamond framework. The framework lacks to recognize different stages of clusters and what kind of strategy is required to develop a particular cluster towards success. Another essential point is that different clusters require cluster policies of a different kind so before formulating any cluster-related policies it is should be

specified what kind of cluster the decision-makers want to create. They suggest that clusters need frameworks that also will help to guide cluster development instead of only telling what is needed to create a cluster. Such frameworks should consist of understanding about the cluster lifecycle and the performance dynamics in order to develop economic growth in a cluster. Similarly, Martin and Sunley (2003, 10–11) argue that Porter's definitions are too indefinite which have led to a situation in cluster literature where defining precisely what a cluster is can be challenging. They point out that cluster definitions should have clear industrial and geographical boundaries that would make clear what is included in a cluster. In the same way, Rosenfield (1997, 8) argues that cluster definition is too vague, and it should be defined more clearly to make it more useful. On the other hand, Porter (2000, 18) demonstrated that cluster boundaries can rarely fit inside a specific industrial sector because of actors on different industrial sectors. Limiting a cluster to traditional categories might even leave some clusters unrecognized.

To overcome the challenge of the cluster definition Gordon and McCann (2000, 515) identified in their study three basic models for clustering: pure agglomeration model, industrial-complex model and social-network model. The purpose of these models is to identify different structural cluster characteristics so that more accurate decisions can be made based on the type of the cluster. The typical characteristic of the pure agglomeration model is to exploit the external economies of the geographic agglomeration. These agglomeration economies consist of a large labor pool, proximity of suppliers and customers, and knowledge spillovers. It can be seen that these agglomeration economies can explain why firms tend to concentrate in particular areas. (De Langen, 2002, 211.) In contrast, McCann & Folta (2008, 535) pointed out that there tends to be two different explanations for the agglomeration of related firms. The first one suggests that the benefits of firms are linked to exogenous factors, such as natural resources, instead of the proximity of other firms and the externalities that come with it. On the other hand, the second explanation is related to the external economies of agglomeration where the locational benefits will increase in relation with the number of firms in the area.

The industrial-complex model is characterized by the geographic concentration of firms where relations between firms mostly consist of trading links and the purpose of minimizing transaction costs. Sales and purchases are primarily influencing their location decisions and large capital investments are typical to create strong trading links. (Gordon & McCann 2000, 518–519.)

The social-network model can include some characteristics from the two previous models but what differs it from the other two are strong local networks. The networks consist of inter-personal relations, trust and will to act towards mutually benefiting goals. However, the co-location of a firm does not guarantee access to social networks in such clusters as past experience and trust are also needed. (Gordon & McCann 2000, 520–521.) It must be noted that Gordon & McCann (2000, 528) argued in their study that these

three models are just ideal types and actual clusters can often include elements from more than one model.

2.2 Cluster advantages and disadvantages

The typical characteristics of a cluster are interconnectedness and networks between different actors. In fact, clusters have been recognized to have exceptional abilities to enhance competitive advantage and value creation through agglomeration economies. A firm located in a cluster can exploit these agglomeration economies in a way that can create competitive advantage when compared with a competitor that operates in isolation. (Connell et al. 2014, 139, 148.) In addition, Porter (2000, 24) stated that individual firms which are located in clusters are able to advance much faster than firms outside clusters. The competitive pressure and comparison to other firms are seen as the driving forces of innovation. However, Harrison, Kelley and Gant (1996, 254) challenged the idea that firms in clusters are more innovative. They found out in their study of metalworking industry that localization does not explain faster innovation when compared with firms that operate in isolation. On the other hand, Porter (2000, 25) points out that all fields do not enjoy the equal advantages of clusters.

To understand why firms tend to cluster, it is important to look at the advantages of clusters. For instance, firms located in clusters can have access to a large local labor pool that consists of skilled and experienced employees. Furthermore, a cluster can offer many job opportunities for employees and the reduced risk of unemployment can attract talented workforce from other places. (Porter 1998a, 81.) Moreover, the risk of having to relocate is lower for employees as they can change jobs without the need to move to another location (Patti 2006, 267). Additionally, in spite of the competition, clusters can increase both the demand for specialized goods and their supply. Also, the cost of accessing such specialized goods can be much lower than elsewhere. (Porter 2000, 23.) A large and specialized supplier base offers opportunities for local sourcing. Also, sourcing inputs locally can reduce many transaction costs such as shipping, delays and warehousing. Another advantage is that local reputation prevents suppliers from overpricing or violating contracts. (Porter 1998a, 81.)

Another advantage of clusters is access to information. Firms in clusters can gain more rapidly information about the new customer needs and trends. Moreover, the flow of information within a cluster enables firms to perceive faster new insights into new technology and components. (Porter 2000, 23.) Clusters tend to promote innovation as a result of competition between local rivals which leads to a constant need to upgrade products.

In the same way, clusters create knowledge spillovers for cluster participants. (Benito et al. 2003, 208.) Sharing knowledge is important in the collaborative ventures and in the

creation of new innovations. Cluster participants have commonly built networks between organizations where knowledge exchange is necessary to fully make use of it. Tacit information can be seen as a resource that is hard to imitate by competitors located elsewhere. (Connell et al. 2006, 140.)

Another essential point is that in the process clusters produce knowledge spillovers that occur between different actors. In the end, these spillovers can result in new innovations and economic growth. (Günther & Meissner 2017, 506.) The knowledge spillovers can occur through both formal and informal channels. The formal channels include i.a. licensing and partnerships, whereas the informal channels include such as the mobility of workers and social meetings. (McCann & Folta 2008, 537.) Moreover, the knowledge spillovers can feature in many forms and in different strengths for individual actors within a cluster (Günther & Meissner 2017, 500). To elaborate, Connell et al. (2014, 147) found out in their study on industry clusters that being located within a cluster is not only enough to get access to knowledge sharing and knowledge spillovers. The spatial concentration of firms does not guarantee knowledge exchange alone. To avoid the free-rider problems, certain assets can be accessed only through investments and cooperation. This encourages firms, regardless of the size, to contribute as they can benefit more from the knowledge spillovers through cooperation. (Porter 1998b, 12.) Similarly, Günther and Meissner (2017, 506) stated that clusters alone do not create innovations, but the location plays an important role in the development of a knowledge base that generates newer knowledge around it.

Also, inside a cluster there is often cooperation with other entities such as public institutions that can create benefits for all cluster participants. For example, investments in university research can create cluster specific study programs that can yield as a return graduates with specialized skills for cluster related jobs. More importantly, public institutions are more willing to offer their resources and abilities to clusters than single firms. (Porter 1998b, 12; Patti 2006, 267.) Another essential point is how government can influence regulations that support cluster activities. For example, strict regulations that have potential to be globally spread can give a head start to companies on global markets. (Porter 1990, 647–649). In the same way companies inside a cluster can inform the government about current constraints on legislation or suggest improvements in regulations that would support or allow their new innovations (Porter 1998c, 257–258).

Even though cluster participation can offer many possible benefits, Porter (2000, 23–24) expressed that there are some risks too. He pointed out that if firms are too inward looking, it can retard innovation. In the same way, Pouder and John (1996, 1213; 1215) identified that if firms focus only to benchmark local competitors, they will have a distorted view of competition that will eventually lead to incapacity to respond to new market demands. This is partly a result of certain group thinking among cluster participants where firms stick to the old habits and are unable to recognize new business opportunities.

Therefore, clusters are prone to both internal rigidities and external threats. (Porter 1998a, 85.)

One of the benefits that clusters offer for new firms is a low risk of entry because clusters often contain a highly developed infrastructure with many assets. For instance, the cluster location can already have potential local customers, a skilled workforce, and local financial institutions that can offer a lower risk premium on capital which can reduce the risk of entry. (Porter 2000, 24.) However, Prevezer (1997, 259) pointed out that the increasing number of firms within a cluster can also result in diseconomies of agglomeration. After a certain point, every new firm can decrease the already existing benefits of agglomeration because more firms start to compete for the same inputs. The rising competition for inputs such as skilled workers and land will lead to price increases. The findings of Folta, Cooper and Baik (2006, 238) support the idea that the diseconomies of agglomeration are related to cluster growth. In their study, they found out that when the number of firms within a cluster rises above 65 firms, the diseconomies of agglomeration start to decline the cluster benefits. It can be seen that the high density of firms might over time turn out to create more disadvantages than advantages (Pouder & John 1996, 1196). Despite this, Maskell (2001, 932) has argued that only the increasing number of firms in a cluster can create new knowledge, otherwise a cluster will decline. The creation of new knowledge can only occur if there is enough variation and the new firms can bring that into cluster through new capabilities.

Both competition and cooperation play an important role in cluster development. Because without them, a cluster will fail. Another essential point is that cooperation must occur on several different dimensions to be able to create value for cluster participants. This cooperation mostly occurs on vertical levels with different actors in related industries. (Porter 1998a, 79–80; 2000, 25.) In fact, only customers and suppliers need to have interaction to be able to do business. Therefore, most of the cooperation will occur on vertical levels. (Maskell 2001, 930.) In addition, vertical integration in clusters can be a more cost effective and efficient alternative than some in-house operations (Porter 1998a, 81). Even though, a continuous competition forces firms in a cluster to constantly improve their efficiencies and search for new opportunities, it does not totally exclude the possibility for horizontal cooperation. The horizontal cooperation can take place when there is an external threat to the cluster or when the cluster participants are not direct competitors. (Patti 2006, 267.)

The local competition can be a strong incentive for firms within a cluster to outperform its rivals. The constant pressure and motivation to outmatch competitors will set firms' goals high. In addition, the location allows competitors to constantly benchmark their rivals. Also, some specific information related to performance and costs is shared among cluster participants. Therefore, it is much easier to compare local competitors inside a cluster because they share the same conditions. (Porter 2000, 23; Patti 2006, 267.)

Moreover, it means that co-located firms can observe and compare every different action and solution that their local competitors do (Maskell 2001, 928–929).

2.3 Network theory

In today's business world networks play a vital role for firms because global competition continuously challenges firms to be more efficient and innovative. Firms need to consider cooperation with other firms because joint efforts can improve their competitiveness. This collaboration means that firms can share costs and risks of new innovations while getting access to new knowledge and technology. (Munksgaard 2015, 279.) Even direct competitors can benefit from networking if they recognize that they have common interests. For instance, cooperation among small rival companies can allow them to bid together for larger contracts that would be otherwise out of their reach. (Carrie 2000, 292.) Also, networks accelerate the diffusion of information and knowledge. One of the benefits is that network members can obtain more accurate information from other members about technologies and costs. (Brass, Galaskiewics, Greve & Tsai 2004, 805.)

As firms tend to focus more on core competencies, the importance of partners with complementary resources has emphasized the role of cooperative relationships. Networks allow firms to cooperate in a more competitive way and for some firms, networks can be the source of their competitive advantage. (Niu et al. 2008, 179.) More importantly, today the concept of competition has shifted from a firm against other firms to a situation where networks compete against each other. Therefore, the competitive advantage of a firm can be largely determined by the strength of the network where it operates. (Lakhal, Martel, Oral & Montreuil 1999, 278–279.)

An economic network can be simply defined as a combination of relationships between firms and institutions. In the markets, firms and institutions that work closely together have built relationships that will form a network. (Kogut 2000, 407.) In the network research, the common perspective focuses on relationships among actors. For a firm, these relationships can provide new opportunities or constrain its actions. (Brass et al. 2004, 795.) Similarly, Klein and Perreira (2016, 155) have defined networks as "a cooperative arrangement composed by a group of members with common goals, usually related, and with an unlimited period of existence". Such cooperative arrangement can arise for several reasons. A common way is a cooperation between two firms that eventually broadens to other firms that have relations with them. Another way is through initiatives that are created by firms with common interests. (Eklinder-Flick, Eriksson & Hallén 2012, 800.) The common interests can arise from similar views between several actors and changes in their environment. In such network formation model different actors try to convince other potential partners to join the network by showing an opportunity or a problem that

would improve also their business if it will be solved. (Lundberg 2010, 153.) Furthermore, networks tend to usually emerge from business opportunities of an industry rather than being especially designed to be formed (Kogut 2000, 413).

Continuously changing markets require adaptation and capability to evolve. Isolated firms are more likely to struggle without the necessary resources, so firms tend to cooperate with other firms that can complement the resources and capabilities that they are lacking. (Wilkinson, Young & Freytag 2005, 669.) To elaborate, Möller and Rajala (2007, 898–899, 905) have suggested a framework with three ideal types of business networks, also referred as nets. The framework consists of current business nets, business renewal nets and emerging business nets. Table 1 is showing typical characteristics and conditions for these nets and the level of determination. They argue that such nets require different organizing and management forms.

Table 1   Business net classification framework (Möller & Rajala 2007, 899)

Current Business Nets		Business Renewal Nets		Emerging Business Nets		
Vertical Demand-Supply Nets	Horizontal Market Nets	Business Renewal Nets	Customer Solution Nets	Application Nets	Dominant Design Nets	Innovation Networks
• Toyota • DELL • IKEA **High-level of determination**	• StarAlliance • SkyTeam • Nectar • Amex	• Offer improvements • Business process improvements	• Construction projects • Software solutions	• Flat panel displays	• Symbian • Bluetooth	• Science-based networks **Low-level of determination**
Stable, well-defined value system		Established value system, incremental improvements		Emerging value system, radical changes		
• Well-known and specified value activities • Well-known actors • Well-known technologies • Well-known business processes • Stable value systems		• Well-known value-systems • Chance through local and incremental modifications within the existing value system		• Emerging new value systems • Old and new actors • Radical changes in old value activities • Creation of new value activities • Uncertainty about both value activities and actors • Radical system-wide change		

Moreover, these nets do also represent different structures for value creation as the main focus can be such as operational efficiency, business process improvements or radical innovations. Möller and Rajala (2007, 901) also point out that actors can be involved in several nets, instead of holding a role in only one net. Especially large corporations that have variety of goals and different activities may hold roles in multiple nets. For instance, Nokia was pursuing operational efficiency nets and simultaneously it took part in many technological development nets.

In the same way, Kogut (2000, 410) has claimed that different network structures may arise because of industry related factors, social norms and institutional rules. The characteristics of an industry can influence how firms may cooperate. Industries that are characterized by technology research tend to promote cooperation between different actors,

whereas in some industries the decision of cooperating or not might be influenced by the operational knowledge.

The driving force for firms to seek partners is to find partners with complementary resources and capabilities. As a result, firms are attracted to find partners that have certain skills or technologies that can complement their lack of such capabilities. An important factor is to find a good mix of similarity and difference so that the cooperation is efficient. (Wilkinson et al. 2005, 670.) Another essential factor in partner selection is trust which will influence the cooperation performance. Trust between firms can be built through previous collaborative experiences where positive and successful experiences can strengthen the bond between the two firms. Firms tend to prefer partners that have met their expectations, and as a result the risk of opportunistic behavior will be much less likely. (Ireland, Hitt & Vaidyanath 2002, 438–439.) In addition, another important criterion in partner selection is the diversity of partners. The more diverse partners a firm has, the more easily a firm can obtain new information that can lead to emerging innovations. In contrast, the lack of diversity might lead to inefficiencies and the inability recognize new opportunities. (Baum, Calabrese & Silverman 2000, 270.)

Complementary to this, Wilkinson et al. (2005, 677–679) confirmed in their study that firms do select partners that have complementary capabilities and resources. This will allow firms to access skills that they do not have or cannot perform as cost effectively. They point out that the way firms emerge in relationships is not random. On the contrary, it is a result of selective choosing where firms seek to match some of their own characteristics with potential business partners. This will more likely yield to a mutually benefiting collaboration.

In another aspect, firms engaging in partnerships can be vulnerable to opportunistic partner behavior as such possibility is often present. The sharing of tacit knowledge to partners comes often with a tension and a certain caution because there is always a possibility to lose critical information and capabilities. On the other hand, sharing such know-how is important to achieve collective learning and innovation. (Kale, Singh & Perlmutter 2000, 232.)

2.3.1 *Knowledge mobility in networks*

Dhanaraj and Parkhe (2006, 660) have defined knowledge mobility "as the ease with which knowledge is shared, acquired, and deployed within the network" The value created in an innovative network is related to how easily the knowledge can flow between the network members. A firm can increase its competitive capabilities by exploiting the knowledge of other network members, but it is depending on how well are the cooperative activities coordinated and supported (Kogut 2000, 406). All the time increasing

international competition and technological development have emphasized the importance of networks. Firm and organizations tend to engage in networks to survive in the market and improve their capabilities. Network participation allows member firms to get access to special resources in other members. To illustrate, access to knowledge and specific know-how in a network can help firms to innovate and strengthen their competitiveness. (Van den Berg, Braun & Winden 2001, 187.)

Certain networks can be characterized by a leader firm that coordinates the cooperation. The potential benefits for other network members are the knowledge spillovers. The more coordinated the cooperation is, the more codified the shared knowledge must be. Although, codified knowledge can more easily spread in other firms outside the network, so the leader firm's strategy will affect what knowledge and how it is shared among network members. (Albino, Garavelli & Schiuma 1998, 54.) Similarly, Van den Berg et al. (2001, 197–198) find out in their study that leader firms, also called cluster engines, can act as a source of knowledge for other cluster members. However, they also argue that a network can become too dependent on a leader firm which might lead to a decline if the leader firm starts to have difficulties as happened with Nokia in Helsinki area.

More importantly, Saxenian (1994, 25–26) found out in her study how network structures might vary within two areas with similar industrial and technological characteristics, and how it can affect the effectiveness of a network. She identified that Silicon Valley and Route 128 have very different network structures. Based on the findings it can be argued that Silicon Valley's network-based system encourages cooperation and collective learning between actors. In this network-based model, company boundaries are almost non-existent and actors are inter-dependent. This is in contrast to the network structure of Route 128 that is based on independent sites, where secrecy in company relationships and low interaction with others restrains the flow of information between actors. In such network it is typical that most of the information flows only vertically.

Consequently, Ferdows (2006, 7) proposed two factors on how knowledge is generated and shared in company networks. Figure 2 shows the different knowledge network structures and how the knowledge is transferred among the network members.
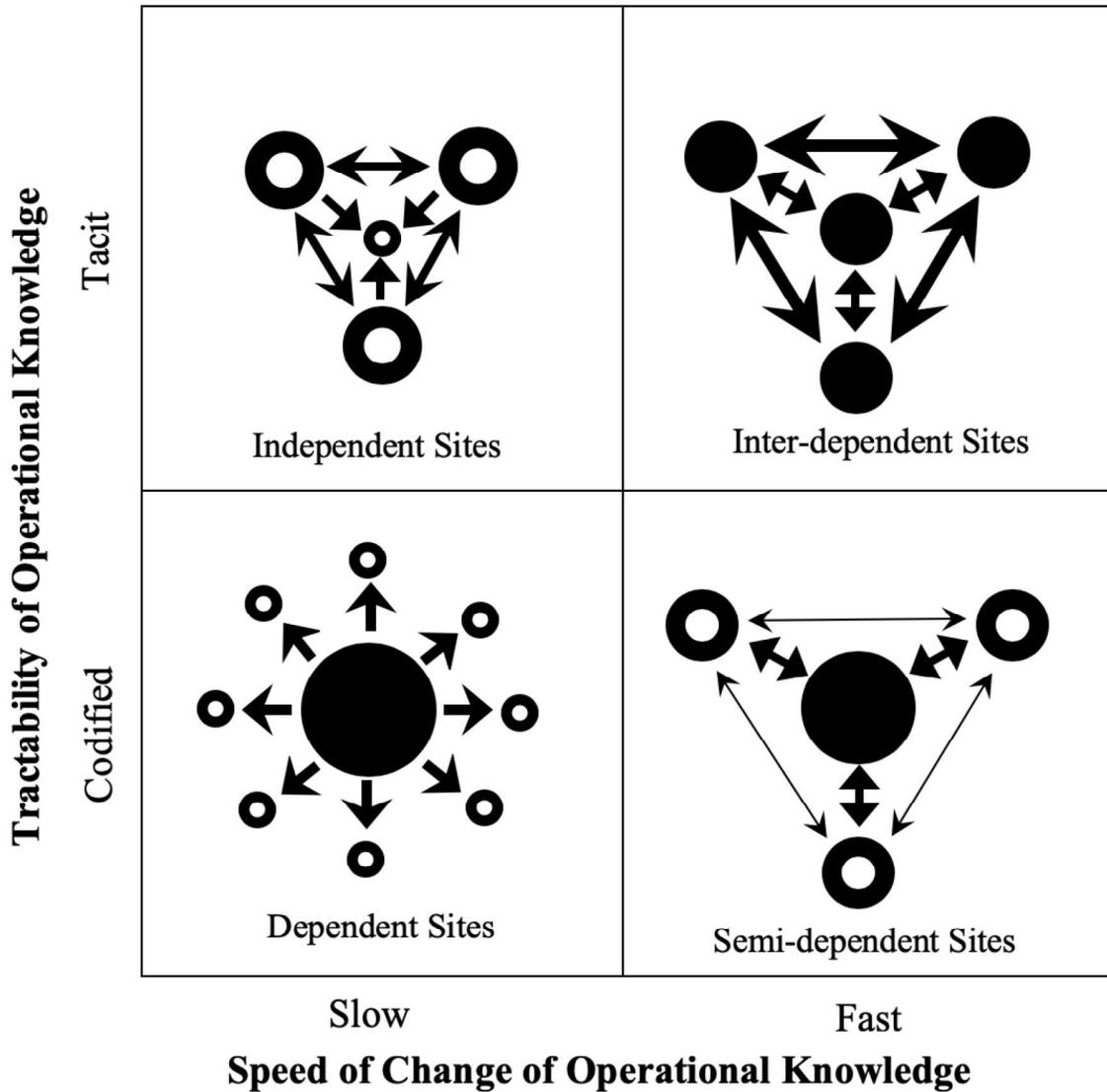
Figure 2   Knowledge network structures (Adapted from Ferdows 2006, 7; Carrie 2000, 296)

The factors contribute to the speed of change in operational knowledge and the tractability of operational knowledge. In addition, Carrie (2000, 296) suggested that the same concept can be used to describe cluster networks. So, instead of describing a single company's networks, Figure 2 shows the different types of cluster network structures and how the knowledge usually flows in each of these models.

2.3.2   Regional strategic networks

Hallén, Johanson and Roxenhall (2009, 22) have defined a regional strategic network (RSN) as "a development cooperation between firms operating in a region with the support of public agencies or other organizations". RSNs are by their nature designed networks that are created by some initiators (Eklinder-Flick et al. 2011, 995). One purpose

of RSNs is to connect firms and other organizations and develop cooperative relationships between them (Persson, Lundberg & Andresen 2011, 1024–1025). The reason for that is normally based on a vision that there is potential for cooperation that could benefit all participants in a region. Therefore, RSNs give participants the possibility to increase the number of relationships and develop already existing ones. (Lundberg 2010, 153.) Similarly, based on the findings of Munksgaard (2015, 286) it can be argued that firms participate in strategic networks to improve their operations and also to find new business opportunities. Other positive effects are related to knowledge sharing and previous experiences with network members.

Other typical characteristics of RSNs are vague goals and visions as the intention is to attract more participants. However, as most of the RSN members do not have previous cooperation with other participants nor do they make remarkable investments, it usually represents low member commitment to the network. (Andresen, Lundberg, Roxenhall 2012, 352.) Moreover, the commitment to the network may also depend on how well a firm's own interests align with the collective goals of a strategic network. This means that when firms are pursuing their own agenda, their input towards common goals can often be related to how relevant they perceive the collective goals. (Munksgaard 2015, 281.) As the functionality of the RSN is depending on how committed the network members are, it is important for these members to reach a common census of the network goals and how these goals will be achieved. To avoid the lack of commitment, the network members need to perceive that the network goals are in line with their own interests. (Persson et al. 2011, 1025.)

RSN settings typically differ from clusters and other types of networks. The starting points for RSN initiatives usually begin from regional problems or due to the lack of existing cooperative relationships. Furthermore, the potential members with certain characteristics must often be chosen within regional boundaries. On the other hand, the right combination of member firms is vital for achieving the network goals. (Lundberg 2010, 160.) A study that was conducted by Persson et al. (2011, 1029) showed that many firms that were invited to a strategic network acknowledged the need for improved cooperation with the other organizations. This was also seen as an opportunity to combine self-interests with the development of a local political agenda as the network firms could make a bigger impact together.

Faerman, McCaffrey and Van Slyke (2001, 377) have proposed that the number and variety of actors in a network can affect its success. If the different actors share a common perspective or they have personal ties, they are more likely to agree on mutually benefiting agreements. Another influencing factor can be the group size as the more actors are involved, the more challenging it can be to find common ground and agree on collective goals.

Complementary to this, Andresen et al. (2012, 546) identified in their study that the representatives' personal goals are related to the overall network commitment. The more these goals are aligned, the more committed a network member will be. They also suggest that long-term goals seem to lead to greater commitment than short-term goals.

2.4 Maritime clusters

Benito et al. (2003, 204) argue that the maritime industry could be divided in two sectors. The first sector would consist of shipping and shipping related services, whereas the second sector would contain shipbuilding and other sectors associated to it. On the other hand, Stopford (2009, 175–180) has in more detail defined that the maritime industry consists of four different shipping markets. These markets are the newbuilding market, the freight market, the demolition market and the sale and purchase market. More importantly, many maritime companies can have activities in several shipping markets. In addition, it can be seen that the maritime industry is a business that has by its nature global markets. Therefore, it is very dependent on business cycles where global demand can define the potential profits or losses. (Benito et al. 2003, 208.) More importantly, Jenssen (2003, 97) has identified four reasons why external cooperation is crucial for maritime industry. The constantly developing need for different transport solutions and new services requires new insights into the industry. Also, the technological development highlights the demand to implement improved and new ICT solutions. Lastly, the external cooperation gives an opportunity to benefit even more from the maritime cluster.

Even though the cluster concept is relatively new, maritime activities have agglomerated for centuries. These agglomerations are called maritime clusters. (De Langen 2002, 209.) Similarly to many other industries, the location has been tied to resources or other physical features. For instance, maritime industry is mostly in proximity to the coastal areas. (Chang 2011, 489.) This geographic proximity is also required to form a maritime cluster (Zhang & Lam 2013, 168). According to Chang (2011, 489) maritime cluster can be defined "as a network of a firm, research, development and innovation units and training organizations, sometimes supported by national or local authorities, which cooperate with the aim of technology innovation and of increasing maritime industry's performance". In other words, a maritime cluster can be described as an area that has clustered near various actors who are directly or indirectly involved in shipping (Shinohara 2010, 377).

The maritime clusters can be divided in spontaneous and constructed clusters based on the public intervention. The spontaneous clusters have grown in favorable local conditions without external help, whereas constructed clusters are a result of policies that have created favorable conditions. (Cruz & Pinto 2012, 105.)

Maritime clusters can enhance productivity and competitiveness in many ways. Amongst other things, they serve a great purpose in the development of networks and innovation activities. (Dikšaitė & Viederytė 2014, 317.) What successful clusters have in common are functional business networks (OECD 2004, 33). In addition, typically maritime clusters consist of various networks that form relationships to multiple parties. These networks can have several purposes such as competing networks, innovation networks, supplier and customer networks. (Viitanen et al. 2003, 19.) Moreover, maritime clusters consist of networks that connect different maritime sectors and their know-how together. These networks inside of maritime clusters aim to generate additional revenue through various activities that create extra value. Both individual companies and whole maritime sectors can benefit from such networks. (Zhang & Lam 2013, 168.) Based on the findings of Benito et al. (2003, 213) it can be argued that a maritime cluster can consist of several subclusters. In their study about Norwegian maritime clusters, they found two sub-clusters that were shipping and manufacturing oriented. Similarly, Knarvik and Steen (1999, 529) stated that these sub-clusters can be self-reinforcing but at the same time also independent. Moreover, their findings suggest that significant economies of scale can be found in these sub-clusters in the maritime industry. In addition, they argue that the economies of scale are mostly generated within a sub-cluster and less between several sub-clusters.

According to Zhang and Lam (2013, 168) relationships in maritime clusters can be characterized as positive, negative or neutral. Moreover, some maritime sectors may have positive relationships that are benefiting both parties, whereas some sectors might have neutral connections that are weak or indirect, or there might even exist positive-negative relationships among some parties. Furthermore, it has been found out that several actors might not interact with all the other entities, so being located in a cluster is not only enough to guarantee interaction. For that reason, in a maritime cluster might not exist connections at all between certain actors. Nevertheless, it is common that several maritime sectors have interrelationships between them. In addition, many companies have networks that reach outside their cluster (OECD 2004, 32).

De Langen (2002, 216) found out in his study about the Dutch maritime cluster that companies acknowledge the agglomeration benefits and how being located in a cluster can improve their competitiveness. Traditionally, the cooperation in the maritime industry has been characterized by factors that contribute to minimizing risks or costs. Also, sharing investments or gaining the economies of scales has been typical. Besides these factors, recently the need to be more innovative in maritime industry has been an influencing factor that has been driving cooperation particularly in the high-cost countries. Especially in the past, maritime industry has been relatively closed when it comes to the sharing of information or gaining new knowledge from other industries (Jenssen 2003, 99). For that reason, maritime companies have to increase their interaction with other

actors both inside and outside the maritime clusters. (Jenssen 2003, 93–94.) Especially the external connections are important for maritime clusters to obtain new knowledge and networks to avoid decline (Njøs, Jakobsen, Aslesen, & Fløysand 2017, 276–277). In addition, the maritime companies may increase their competitiveness by developing new relationships to other industries. For instance, many maritime companies lack the skills and competency to fully utilize new ICT solutions. Therefore, it would be important to improve cooperation with other industries such as the ICT industry. (Jenssen 2003, 96–97, 99.)

3   RESEARCH DESIGN

3.1   Research approach

Marshall and Rossman (1999, 21) describe research as "*a process of trying to gain a better understanding of the complexities of human experience"* The aim for the researcher is to gather information about actions and interactions through a systematic strategy. The researcher then studies meanings in a way to reach a conclusion and to make interpretations based on that information.

Quantitative and qualitative research methods offer different research approaches for the researcher. Choosing a research method depends upon what is the research topic and what is wanted to be found out. The choice should be based on the most appropriate methods for it. (Silverman 2000, 1.)

For this study, the chosen research approach is qualitative for numerous reasons. Qualitative research gives an opportunity to study complex phenomena and it suits particularly well for business related contexts. It produces new information about how and why things work in a certain way in their contexts. (Eriksson & Kovalainen 2008, 3.) Moreover, qualitative methods suit well for understanding processes, finding causal relationships and why certain events or actions lead to certain outcomes (Marschan-Piekkari & Welch 2008, 512). Therefore, qualitative research suits well also when there is lack of prior knowledge of a phenomenon as qualitative research tends to be exploratory and great for studying unstructured or unmeasured problems (Eriksson & Kovalainen 2008, 5). Similarly, Marschan-Piekkari and Welch (2004, 8) pointed out that one benefit of qualitative research is that it can produce new knowledge when measuring or observing is not sufficient, and how it can help to understand the meanings behind these actions. According to Creswell (1994, 21) qualitative research is particularly relevant when the study is exploratory, the topic has not been studied much or the purpose is to get insights from informants to build a picture from their point of view. Furthermore, Marshall and Rossman (1999, 2) describe that qualitative research genres are naturalistic and interpretive, and those exploit several research methods.

Eriksson and Kovalainen (2008, 7) introduced several qualitative research approaches that can be used in a qualitative study: case study, ethnographic, grounded theory, focus group, action research, narrative research, critical research, discursive research, critical research and feminist research. A case study approach is chosen for this study as it suits best for the purpose of this study. As this study seeks to answer several "how" questions, a case study is a favored approach as the researcher has little control over events and the phenomenon under study is in a real-life context. This approach is in particular useful when there is not much research on a topic or when looking for a new perspective.

Nevertheless, a case study suits also for other types of research, such as explanatory research, rather than just for exploratory or descriptive research. The choice between different research approaches depends upon research questions and when the study seeks to answer "how" and "why" questions is a recommend research strategy a case study method (Marschan-Piekkari & Welch 2004, 110–111).

The characteristics of a case study make it a great method of presenting complex and otherwise difficult to understand issues in their context. Thus, a case study can be seen more as a research strategy than a method when the focus is in complex issues that are difficult to study with quantitative methodologies. (Eriksson & Kovalainen 2008, 116–117). Similarly, Marschan-Piekkari and Welch (2004, 109) stated that a case study is not a methodological choice, but rather a strategy for focusing on the object to be studied. A case study can help to deepen the understanding of the phenomenon especially when little is known about the topic. Moreover, a case study is a process of learning about the case where the researcher learns more in the process. In addition, a case study can be used in both qualitative and quantitative studies.

A case study research can be either intensive or extensive. For the purpose of this study, an intensive research design is chosen as it suits best for studying one or few cases with the aim of finding out as much as possible about the phenomenon. On the contrary, the extensive case study which is more common in quantitative research, focuses more on finding patterns and testing theory by comparing several cases. An intensive case study is relied more on the qualitative research traditions and focuses on understanding a phenomenon through interpretations. (Eriksson & Kovalainen 2008, 118–119.)

Another essential point supporting intensive case studies occur when the focus is to study a specific case, a thick description will make interpretation easier so that the meanings can be made clear. The aim of intensive case studies is to offer a way for the researcher to make interpretations about the case. The general purpose is to construct a narrative that helps to understand why and how certain things happened. More importantly, the main purpose is not to generalize findings to other contexts in the traditional way but instead to explore and understand how the selected case works and what it means. For that reason, a case study approach is chosen as it is the most appropriate approach for this study. (Eriksson & Kovalainen 2008, 120–121.) Another reason for choosing a case study method is that it allows the researcher and respondents to ask questions until they find answers that allow sufficient interpretation of the research subject and at the same time check their understanding (Marschan-Piekkari & Welch 2004, 111).

There are multiple ways to collect data for case studies. For this study, data collection will be gathered through personal interviews as it can give deeper understanding about the studied phenomenon and therefore, suits well for qualitative research (Marschan-Piekkari & Welch 2004, 109–110).

3.2   Research context

Selecting cases is one of the most important issues in a case study research. Firstly, a target population needs to be decided for the study. Secondly, after accessing the accessible population a certain number of cases or objects needs to be selected from it. The main criteria for selecting cases should be that they are consistent with the research problem and fit within the theoretical framework. (Marschan-Piekkari & Welch 2004, 112.)

In order to analyze how companies in maritime clusters are networked, it was important to define boundaries for this research. Companies that have been participating in One Project were chosen as the research context. One Sea is a project that aims to combine different maritime experts and actors in one ecosystem in Finland with the goal to be a forerunner in autonomous shipping (One Sea). The Finnish maritime cluster consists of various different actors that have different knowledge and know-how. Therefore, One Sea has gathered companies and organizations together that can advance the maritime industry. Among other things, these actors represent different maritime sectors that are related to various maritime solutions and technologies, cargo handling, engines and other maritime products. In addition, actors are not limited to only maritime players as other industries such as the software and communication industries are also present. The purpose of One Sea is to gather these actors from the Finnish maritime cluster together so that they could accomplish something bigger together. In addition, every member has their own expertise, partners and networks that they bring to the table. That aside, besides the common goals, all the participants also have their own goals and wishes for what they want to achieve. So, the participation in One Sea project can offer a glimpse into the networks of companies in maritime industry.

In addition, Marschan-Piekkari and Welch (2004, 114) have stated that the research problem and the research objectives define the number and choice of cases to be studied. In most cases, one case can be enough, especially when a particular case is unique or special. For this study, a single case is chosen.

3.3   Data collection

According to Creswell (1994, 149) there are four different ways to collect data in qualitative research: observations, interviews, documents and visual images. In this study, data will be collected by conducting several interviews. Usually, an interview is a conversation that consists of questions and answers between the interviewer and the interviewee.

Normally the interviewer talks first and asks questions that the interviewee then tries to answer. A common way to do interviews is face to face but there are also other methods such as telephone interviews or online computer interviews. In this study will be conducted face-to-face interviews. The most common interview is normally conducted between two people, the interviewer and the interviewee but in several occasions group interviews can provide additional value. (Eriksson & Kovalainen 2008, 78.) The interviews conducted in this study are between two people. As identified by Emory (1985, 160) personal interviews can provide deeper and more detailed information than interviews conducted via telephone or surveys as the researcher can improve the quality of information received. This method can provide great value as it allows for more interaction. In the same way, Marschan-Piekkari and Welch (2004, 186–187) pointed out that interviews might allow access to deeper information than what could be secured through written questionnaires. Therefore, interviews suit well especially for exploratory and theory building studies while a questionnaire might not gather enough information about the research subject. Similarly, Eriksson and Kovalainen (2008, 80–81) stated that in business research interviews are commonly used because they are an efficient way to collect information that has not been published before. Moreover, interviews offer a way to study people's experiences from their perspective.

Weinberg (2002, 112) defines interviews as a special form of conversation and as a way of transmitting knowledge. The interview methods can vary from highly structured interviews, to standardized or open interviews but they are all interactional. Hence conducting interviews is a great way to collect information, it might lead to a misunderstanding, misdirection or errors. This can be avoided by asking the right questions so that the answers will provide the desired information.

3.3.1   Participant selection

Instead of selecting participants randomly to interviews in qualitative research, Creswell (1994, 148) suggests that it is often better to purposefully select informants that have the necessary knowledge and will most likely answer best to the research questions. A common method of purposefully selecting participants is called a snowball chain or network sampling technique. It means that one person is first interviewed who can then suggest other people to be interviewed that might be relevant to the study. (Eriksson & Kovalainen 2008, 52.) Similarly, Emory (1985, 280) defines purposive sampling as a method where sampling is based on certain criteria. It can be divided into two different types, judgement sampling and quota sampling. Judgement sampling means that participants will be selected based on some criteria. More importantly, a judgement sampling suits well for an exploratory study.

For instance, in this study the participants were selected based on their involvement in One Sea project. A judgement sampling suited well for this purpose as the idea was to find participants for the interviews that have knowledge based on their experience in maritime business to understand how companies in maritime clusters are networked. One Sea project suited well as a framework for participant selection because the involved companies represent different sectors in maritime business and therefore, it can give a better view of the maritime industry.

At the beginning of the participant selection process six potential participants were contacted by email. The email included the following information about the interview and the study: the purpose of the study, why it is being studied, interview themes, estimated length and a note that all material will be handled confidentially. Three participants did reply and accept an interview request shortly after the emails were sent. The other three did not reply in spite of a couple of reminding requests. After the first few interviews were conducted, two more interview requests were sent based on the suggestions of the interviewees. The snowball chain sampling technique supported judgement sampling well in this occasion as it ensured that all the relevant people received an interview request. These two new interview requests were also accepted. A total of eight interview requests were sent for this selected group of people and from whom five answered and accepted an interview, three did not answer and no one declined.

Due to the fact that one or more companies wished to remain anonymous, all the interviewees and companies they represent have been renamed to protect their anonymity. Companies are called Company A, Company B, Company C, Company D and Company E. In the same way, interviewees are called Informant A, Informant B, Informant C, Informant D and Informant E.

The first chosen interview participant, also called Informant A, works as a manager at Company A, which is focused on offering different maritime cargo handling solutions. The next interview participant, Informant B, is a head of research and development. Informant B works in Company B, which is specialized in shipbuilding. Moreover, Informant C from Company C is a research manager. The Company C comes from networking and telecommunications industry. The informant D is in charge of innovation and technology at Company D. Marine is one of the business sectors that the Company D has. The fifth interview participant, Informant E, works in Company E that manufactures multiple marine products, such as engines, and provides large variety of marine solutions. Informant E holds the responsibility of a vice president.

3.3.2   *Interviews*

The semi-structured interview suits well for this study because it ensures that the collected materials will be mostly organized and explained in detail. In addition, the whole interview will then be more conversational. (Eriksson & Kovalainen 2008, 82.)

Before the first interview, all interview questions were sent for comments to supervisors and two other professors to make sure that all the interview questions focused in right areas and were easy to understand. The researcher edited some of the interview questions based on their feedback. Even though, all the interview questions were written in beforehand, the researcher saved the right to ask more detailed questions during the interviews.

All the interviews were conducted face-to-face in the mornings between the 27th of March and the 8th of June 2018. As all the interviewees spoke fluently Finnish, therefore all the interviews were hold in Finnish for richer data. Table 2 summarizes the conducted interviews. The table includes all the interviewed companies, experts, their responsibilities, the place, the date and duration of the interview.

Table 2   Summary of the interviews

Expert	Responsibilities	Company	Place	Date	Duration
Informant A	Manager	Company A	Office, Kaarina	27.3.2018	55 min
Informant B	Head of R&D	Company B	Headquarters, Turku	3.4.2018	51 min
Informant C	Manager	Company C	Office, Kirkkonummi	4.4.2018	54 min
Informant D	Head of I&T	Company D	Office, Turku	9.4.2018	47 min
Informant E	Vice President	Company E	Headquarters, Helsinki	8.6.2018	45 min

After the first interview the researcher made some minor modifications to the interview structure and rephrased some wide questions to be more precise. The first interview served also as a test to see how well the interview structure worked, how easy it was to understand the interview questions and how well the estimated interview length matched reality. Otherwise all the interviewees were asked the same questions.

There are multiple ways to record an interview. For example, according to Eriksson and Kovalainen (2008, 85) tape recording is one that suits well for recording an interview. For that reason, all the interviews in this study would be tape recorded if the participants find it suitable. Before starting an interview, the researcher asked from the interviewees if it is suitable to tape record the interview. As all the interviewees agreed on tape recording, all the interviews were recorded to make sure that all the information could be

collected for later analysis. The researcher used two tape recorders to minimize the risk of losing data or facing any technical issues.

At the beginning of each interview the researcher first introduced the study and the motivation behind it, then went through the structure of the study and reminded the interviewee that all data will be collected anonymously and according to ethical rules. In addition, another purpose of the introduction was to create a friendly atmosphere for the interview and increase trust. Overall, all the interviewees were able to give long and comprehensive answers to almost all the interview questions.

The first interview with Informant A was hold at the Company A's office in Kaarina in a closed meeting room. The actual interview progressed smoothly and the informant A answered with long and clear answers to most of the questions. The interviewer did not have to steer the interview in a certain direction as it progressed as planned. All the planned questions were asked but there was an occasion where the interviewee's answer overlapped with another question, the other question was skipped as it had already been answered. The atmosphere during the interview was relaxed and there were also moments when the interviewee used humor and metaphors while answering questions. The interview lasted 55 minutes.

The second interview with Informant B was conducted at Company B's Headquarters in Turku. Similarly, the interview was held in a closed meeting room. Again, the interviewee was able to answer with long and informative answers. In the middle part of the interview, the answers were shorter but more conversational. Also, the interviewer asked sometimes elaborating questions to gain deeper understanding about the current matter. The atmosphere varied from businesslike to relaxed. All beforehand planned interview questions were asked. The second interview lasted 51 minutes.

The third interview with Informant C was also held at Company C's office in Kirkkonummi. The atmosphere in the closed meeting room was slightly reserved at the beginning of the interview but both the interviewer and the interviewee became more relaxed during the interview. The interviewee answered well and clearly to all interview questions. Some of the answers even contained humor and metaphors. Again, all the interview questions were asked. The third interview lasted 54 minutes.

The fourth interview with Informant D took place at Company D's office in Turku. The closed meeting room was slightly smaller than in the previous interviews which made the atmosphere more relaxed already at the beginning of the interview. The interviewee was calm and relaxed throughout the interview. Also, at the beginning the interviewee informed that the time must be limited to less than an hour, so the interviewer decided to skip two questions to agree to the interviewee's wish. The interviewee answered with long and comprehensive answers. In addition, there was some dialog between the interviewer and the interviewee from time to time. The fourth interview lasted 47 minutes.

The fifth interview with Informant E was held at the Company E's Headquarters in Helsinki in a closed meeting room. The overall atmosphere was already quite relaxed from the start. The interview progressed as planned and the interviewee was able to answer with long and detailed answers to all questions. During the interview, the interviewer asked some elaborating questions to go even deeper into some subjects. The interview lasted 45 minutes.

In summary, five interviews were conducted, and the length of the interviews varied between 45 and 55 minutes. Moreover, all the interviewees were able to give professional and comprehensive answers. That aside, all the tape recordings were mostly clear and easy to understand, there were only a few moments when it was challenging to clearly hear what the interviewee did say on the tape. However, two tape recorders made it much easier to understand those challenging moments as usually one recorder at least recorded clearly what the interviewee did say.

3.4　　Data analysis

The researcher started the analysis by first transcribing all the five interview recordings electronically which was followed by printing the transcribed material also on paper. Firstly, every interview was break down into three smaller color-coded themes that were based on the research questions. In addition, an operationalization table was created to support the analysis. Table 3 presents the operationalization table that was used as a framework in this study.

Table 3　　　　　Operationalization table

The research objective	The sub-objectives	Theory/Literature	Themes	Analysis/Codes	Research findings and contribution
How companies in maritime clusters are networked	How are companies and stakeholders networked?	Cluster theory Network theory	Networking Partners Cooperation Development of networks	Chapter 4.1 Green code	Partner characteristics Cooperation with many stakeholders New partners
	Why are networks relevant?	Cluster advantages and disadvantages Network theory Knowledge mobility RSN	Knowledge Know-how New ideas Advantages of networks	Chapter 4.2 Blue code	Value creation New ideas Competitiveness Sharing costs Network influence
	What kind of know-how should maritime clusters contain in the future?	Maritime clusters	Development of cooperation New network structures Cluster development	Chapter 4.3 Red code	Digitalization New know-how Cross-industry cooperation

The table shows how theory, analysis, themes and findings were constructed. The three color-coded themes were green, blue and red. The green code included everything related

to how the interviewed companies are networked. The blue code examined key points why are networks relevant to maritime cluster companies. The red code covered the needs that the companies thought to be relevant to maritime clusters in the future. Secondly, the researcher wrote notes to every color-coded section in the materials and emphasized key words or findings. Additionally, all the color-coded themes were given a sub number and those were checked to make sure that those concerned with the right subject. Thirdly, each color-coded theme was broken down into smaller subthemes based on the key words and findings. These subthemes were written on post-it notes, so that the researcher could easily visualize the structure of each theme. In this phase, the materials from different interviews were also combined according to the matching subthemes. This helped the researcher to also combine similar findings into same subthemes. Moreover, each post-it note contained the following information: the name of the subtheme, the interview and the sub number of the color-coded theme. Fourthly, when all the material was dealt in subthemes, the researcher put all the subthemes in a logical order that would be used in the analysis. The operationalization table guided the process. Fifthly, each subtheme was analyzed in the organized order.

To sum up, the structures of the interview materials were very similar which helped to compare the findings. Even though, Eriksson and Kovalainen (2008, 82) mentioned that the semi-structured interviews can sometimes be challenging to compare, in this study the interviewees answered the questions in a similar way which made it easier to analyze the interview materials.

3.5   Evaluation of the study

Evaluation of the study is important for the researcher to assure the readers about the trustworthiness and quality of the research. For every research, evaluation criteria must be chosen that is compatible with the nature of the study. In terms of qualitative research, this means that the chosen research approach in methodology, aims and assumptions must be compatible. It is also important to notice that for qualitative research it is recommended to adopt evaluation criteria that are meant to be used in qualitative research because mixing evaluation criteria from quantitative research can lead to an unreliable quality. (Eriksson & Kovalainen 2008, 290.)

According to Lincoln and Guba (1985) trustworthiness can be assessed through credibility, transferability, dependability and confirmability. As Eriksson and Kovalainen (2008, 294) stated that for qualitative research it is better to replace the traditional evaluation criteria of validity, reliability and generalizability with evaluation criteria that suits better for the nature of qualitative research.

Credibility refers to the degree of findings corresponding to reality (Lincoln & Guba 1985, 296). It can be evaluated on the basis of how sufficient the gathered data is to substantiate the claims and how well the researcher is able to build links between the observations and theory. Also, credibility can be improved if the researcher is familiar with the topic. (Eriksson & Kovalainen 2008, 294.) This can be achieved through prolonged engagement where the researcher has invested sufficient time to understand the phenomenon under study (Lincoln & Guba 1985, 301). In this study, the researcher has familiarized with the phenomenon for a period over a year to deepen the understanding about it. To increase the credibility of this study, all the interviews were recorded on tape and all the recordings were fully transcribed after the interviews. In addition, the findings are based on transcribed material from the interviews. Moreover, all the interviewed companies represented a slightly different business sector in maritime industry which increased the credibility of the gathered data. In addition, an operationalization table was made to support the transparency and structure of this study. Even though, the interviewed companies were renamed, information regarding their business sector and the titles of the interview participants were given. The truthfulness of the gathered data is based on the assumption that the interview participants have been truthful. To increase the truthfulness, the participants were selected based on their experience and suitability for this study. Additionally, similar findings were made from the gathered data which supports the truthfulness as the participants were not aware the answers of other participants.

Transferability is related to how well the findings of the research can be generalized to other research contexts. The aim is to show the degree of similarity and connection between this research and previous results. Transferability can be improved by providing the tools and opportunity for other researchers to replicate the study so that they can achieve similar results. This can be acquired through a well-described research setting where all the details are available so that similar research conditions can be established. (Lincoln & Guba 1985, 316; Eriksson & Kovalainen 2008, 294.) The research setting, conditions and methods have been well-described to increase the transferability of the study. Additionally, One Sea project was selected as a framework for this study as the member companies operate in the different fields of the Finnish maritime cluster. That aside, the findings of this study show similar results to previous research and literature which supports the transferability of this study. Similarities were found in both cluster and network theory but some of the findings are perhaps more specific to maritime industry.

Dependability describes how the research process has been conducted and offers information to the reader of how each step was executed. It is important to provide information that the research has been coherent, traceable and properly documented. (Eriksson & Kovalainen 2008, 294.) As the conditions of the research can sometimes change during the process to achieve better understanding about the phenomenon, it is appropriate to

describe all the changes in research design and conditions. (Remenyi, Williams, Money & Swartz 1998, 117.) To improve dependability, the research process has been described in detail in chapter three to provide information regarding the different steps made in this study. Similarly, a table was made to show the essential information about the conducted interviews. In the same way, the interview situations have been described increasing dependability. Even though each step of the research process has been described in order to increase objectivity, it must be noted that the researcher's interpretations of the gathered data can be prone to some subjectivity as every individual can comprehend things in a slightly different way through biases and personal perspectives. To reduce subjectivity in this study, every step and decision made in this study has been tried to be described and validated by the theory. Also, the methods used in the data analysis have aimed to increase objectivity.

Conformability refers to what degree the findings of the study are linked to the data collected and how easily another researcher could replicate the study with similar results (Eriksson & Kovalainen 2008, 294; Lincoln & Guba 1985, 300). As this study was limited around the participants of One Sea project, another researcher could easily replicate this study even though the names of the companies were hidden. More importantly, the whole research process has been tried to describe in a way that would make it easier to be replicated. Also, the interview questions are presented in Appendix 1. In addition, the data analysis has been described in a way that would make it possible for another researcher to use in the data analysis the same methods, themes, subthemes and color codes. These methods enabled the researcher to analyze vast amounts of transcribed data in a way that made it logical and transparent.

4   FINDINGS

To increase the readability of this study, the findings have been divided into three sections according to the sub-objectives.

4.1   How are companies and stakeholders networked

Company A has strong ties with shipping companies and they have been doing cooperation in multiple sectors. Strong cooperation and communication enable Company A to enhance their products and solutions according to customers' wishes in a way that will benefit their business. Moreover, Company A does cooperation with multiple companies located especially in the Turku area. On the other hand, Company E's interviewee sees that their networking in Finland is still somewhat limited as their approach is more internationally oriented. The same international approach guides Company E when they need partners for new projects and often the right partner has been found somewhere else than Finland. Nevertheless, Company E has been doing all kinds of business projects with different companies and through the Finnish maritime cluster they have been in several projects with shipyards where they are cooperating intensively especially in the early stages of projects to build integrated solutions to ships. After the early stages, usually more partners join to build a comprehensive solution for the customer. More importantly, Company E thinks that it is important to look also in the future, so they have a constant screening of potential new partners

For over three decades the Company B has been doing development cooperation with different marine technology actors. Wide networks are natural part of Company B's business. For example, they see themselves as an integrator who are responsible for the development of concepts together with its customers. In addition, as a shipyard they do cooperation with hundreds of companies during the shipbuilding process. Also, a major part of the designing work comes from its network. In contrast to other companies, Company C's relationships in maritime clusters and networks come mostly through external research projects. Tekes-projects and One Sea ecosystem have served as a link that has connected Company C with other maritime companies. It all started over ten years ago, when Company C started to create relationships with companies from other industries, but the path has not been not easy. What they learned from the process was that it was challenging to start a dialog with other companies from different industries because there were very limitedly intersections between the ICT-sector and more traditional industries. The external projects are seen an important way to get to know other companies better and as a starting point for cooperation. In the same way, the external projects are seen as a great way to start building trust between companies. Additionally, Company C believes

it is a way to find new contacts, and it also enables further cooperative discussions between two parties.

Company D thinks it differs from other companies in that sense that it purposefully has started to build up networks that are comprised of competitors. They believe that not many companies operate in such manner where they are willing to reveal their own networks and to believe that there is more power in the cooperation. Furthermore, Company D has had many cooperation projects and is generally active in maritime industry. Besides the fact that they have been creating new cooperation networks, they have been also invited to many cooperation projects in various industries. One of the reasons why they believe that they have been invited to so many projects is related to their activity and the urge to build up new structures. Moreover, they have been one of the most active players in One Sea project and for them, it is important that also other partners are always satisfied.

All the companies also have international cooperation and networks. In fact, Company C sees that even when you do local cooperation, you always have to have a global perspective on things. In addition, it can be seen that it is perhaps easier to create networks first within a cluster or on a national level before expanding further. Similarly, it can be seen that doing globally business is part of maritime business as informant E states it:

> *To be able to operate in maritime industry you have to practically always have a global market. (Informant E, Company E)*

Moreover, this international mindset can be well seen in the daily operations of Company E. For instance, they have cooperation with universities from Germany and Norway, but they always look first what they need and from where they could get it. So, they do not have to start searching from a certain place when they need a specific know-how, whereas they can look what suits best in their needs, and that is important for them. It is apparent that most companies have academic cooperation also outside Finland, especially with universities that have maritime or otherwise related education.

The majority of companies also have several EU-projects that have international approaches. Besides that, Company B is a member in many international shipyard and equipment supplier networks in Europe.

The cooperation is not limited to companies only as they do also continuous cooperation with governmental authorities and organizations. Such as the IMO (International Maritime Organization), Trafi (the Finnish traffic committee) and the ministry of transport and communications with whom all they have constant discussion about current issues and what needs to be considered in the future. In addition, under the IMO there are multiple conclaves where companies have influence. Furthermore, projects and initiatives with other companies have opened new possibilities to use common subcontracting

networks but mainly the cooperation is limited to general discussion. Company B has been involved in many networks with different organizations. They have been doing co-operation in Finland i.a. with FIMECC, DIMECC and their predecessors. However, not all development cooperation has involved an organization or a company behind it. On the European level Company B is involved among other things in organizations for shipyards and other maritime organizations. Company D is also involved in many state projects because of their cooperative and positive approach that is combined with the ability to envision.

In the field of know-how Company A tries to have constant discussion with governmental authorities regarding new regulations and laws.

> *We try to be in a constant discussion with governmental authorities about the new regulations because it is clear that the ministry might not have the same knowledge as we do. We try to bring out our know-how so that the discussion would be directed towards right things and in that way influence the bigger picture. (Informant A)*

Moreover, Company A has given information and their own specific know-how to the governmental authorities to help with the decision making.

Other important cooperation partners are universities. According to Company A, the cooperation in networks has improved during years and to the universities' credit the triple helix model of innovation has been greatly valued. This refers to increased interaction between universities, companies and government where the government has enabled the financing for such cooperation. Almost all the Companies do cooperation with universities such as Aalto University, University of Tampere and University of Turku. Also, University of Lappeenranta and Turku University of Applied Sciences are mentioned several times. A few companies also had cooperation with Åbo Akademi University, University of Vaasa and University of Oulu. In summary, cooperation with the universities of applied sciences is more practical than the fundamental research done with the universities. According to Company D the cooperation with the universities of applied sciences in the Turku area needs improvement. The current status of cooperation is very limited and nothing tangible has come out of it yet. A few companies have been doing cooperation even with comprehensive schools. Company A and Company C believe that it would be important to already influence young students in comprehensive schools and rouse their curiosity towards certain disciplines. The cooperation can be for instance, anything between company or school visits.

Another way how companies are doing cooperation is that almost all the companies lecture in universities or events. Sometimes it can be also the opposite when their employees take further education. Also, some companies organize or participate in student

projects. So, the cooperation with academic institutes can vary from just a single lecture to a more long-term work. The invitation for cooperation can come from both parties depending on of the current needs. In addition, generally the cooperation with universities is based on both projects and long-term cooperative activities. In fact, looking perseveringly in things is vital for securing the continuity of operations. The long-term cooperation is built through projects that can simultaneously initiate new ideas. Some of the research projects are more practical and based on a specific need or problem. As an example, Company E is conducting mostly traditional research that is related to engines. However, they do have large variety of different projects and some projects can include also field research. The companies have also actively been involved in several government or state funded projects. What differentiates these projects from private projects is a shorter, more specific time span.

The universities might also suggest new projects that are starting soon and asking companies if they would like to participate. Planning together is important for the companies to be able to find mutually benefiting projects. The constant discussion also enables universities to understand better what problem areas the companies see in their industries. In other words, they highly value the research but sometimes it requires time to guide the research in a right direction so that the full potential of the research can be realized. Companies believe that this can be accomplished through industry knowledge and that the motives from both sides would meet a common ground. The challenge might lie in cultural differences as companies and universities approach the same problem from different viewpoints. The companies need more concrete solutions, whereas the universities might have other gauges of success. As an example of successful cooperation, Company D praises the results of AAWA-project. In the AAWA-project different fields of know-how were successfully combined which resulted in both concrete solutions and globally recognized white papers.

Recruiting through external cooperation and university contacts have been a great source of employees for Company C.

> *That way we can find promising students for whom we offer a thesis commission and if they prove themselves to be good, we hire them. (Informant C, Company C)*

Therefore, it is important that universities are part of the network and especially Company C has invested in that specific area. Company B is another company offering chances for student projects and also organizes some training or education lessons. Cooperation with universities also includes annual innovation camps with students which allows Company A to see students and get to know them better. Moreover, Company B is offering students a chance to participate in different student projects and they also

organize some training or education lessons. This is partly in contrast to Company D which has been doing cooperation with university students, but they have been struggling to find a working cooperation formula. Even though they are well-known, they think that they have not found the right channels yet for it. Nevertheless, they have good connections and weekly dialog with university professors. They have even been contributing to the development of shipbuilding education in the Aalto-university so that more ICT-related subjects would be taken into the education programs.

To elaborate, Company D has not had many student projects or thesis commissions, but they do have been promoting students to Turku area and offering several summer trainee positions. One reason for the lack of continuous academy cooperation could be the scarcity of resources. They believe that they do not have enough employees to put more effort in student cooperation at the moment. So, for that reason their involvement is limited.

Network relationships with partners are seen important and several characteristics seem to influence the choice of potential new partners. Firstly, a potential partner is someone who has previous experience either from the industry or working together. Overall, it can be seen that a good way to start a partnership is to first do some minor projects together to see how the cooperation works out and to gain some common experience. On the other hand, Company B points out that even though previous experience is important, sometimes the best partner can be found outside the maritime industry. Secondly, trust is highly valued as a partnership is mostly based on it. It is important to know that you can trust your partner and that the partner will not try to exploit you. Sharing information among partners is vital for the full potential of partnership but trust defines how much information can be shared. To overcome such issues as trust, it is important to agree on common terms and make cooperation agreements. Cooperation agreements can also highlight what is expected from both sides and it should motivate both sides work together when clear boundaries have been made about what belongs to whom. In fact, Company E has developed a practical approach where they first search for what they need, how it can be achieved and who will own the material rights in the end. So, when Company E is starting a new cooperation and the goal of the cooperation is to find a solution or a result, they have already looked for potential outcomes from economic and legal outlooks that will help them to understand if they can benefit from that partnership.

Company B, Company C and Company E reported that the process for a new partnership usually starts from a specific need. For instance, if the companies happen to know universities or academies that have certain knowledge and know-how what they are looking for, then they prefer to do cooperation with such parties. It is also recognized that such special know-how exists in academic institutions what companies might be looking for. In addition, Company C has received numerous calls from academic institutions regarding different research projects and they always look into all invitations. If it feels

reasonable, they might come along. Equally important in the academic cooperation is that Company C has been constantly looking for partners that can produce great ideas and results. They have been consciously open for cooperation with new academic groups and that has allowed them to see how the cooperation has worked out. In time, certain regular research groups have formed of the cooperation and they can carry out good results with these groups. Moreover, Company E thinks that they do not have certain criteria for potential partners. However, when a certain need comes up, they start to look for the best possible partner to fill that need.

When looking at the ideal partner characteristics, Company B sees that past experience is important. Moreover, they have many important partners as most part of the ship is built by outsourcing. Also, every now and then they are discussing opportunities for long-term partnerships. Similarly, according to Company E past experience and trust are valued partner characteristics. They see that one benefit of a private company is the possibility to choose its partners without the need to tender everything. When looking for a potential partner, Company C usually starts from the subject and then considers partners from the past projects. Generally, they see that it is easier to find partners from your own industry. Besides the normal supplier value chain relationships, Company D aims to create totally new relationships with players from different industries. They believe that one of the most important ways is to develop new networks together with competitors. That aside, Company D also mentioned that in fact there is not much need to network more within the maritime cluster as everyone aims to reach outside the cluster. There are many new areas of technology and networks related to it that are all outside the traditional maritime cluster.

To fully benefit from cooperation with partners, Company A considers it important that both parties are well motivated. This way both parties can focus on their own goals and simultaneously support the other party to achieve their goals with the help of their own know-how. Also, a well structure cooperation agreement can help in the cooperation activities in a way that allows certain know-how to be shared between the two parties. It is also much easier to have an influence on your partners in a project, if you are there from the very beginning. However, if the invitation to a project comes from outside and there are already other partners, then there is still the possibility to recommend partners that should be invited too. Of course, there can be large projects that have several different areas, in which case the companies might not be even doing cooperation with all participants.

So past experience from the industry is highly valued. Still sometimes it can be very hard to decide who are the best partners. For example, Company D is striving for long-term partnerships, but sometimes they have difficulties in finding suitable partners. As most of the potential cooperation partners are saying that they are capable of doing what Company D is looking for, but in fact, there are not so many companies in the world that

have already experience or know-how for example about the autonomous ships. They just have to try and see which partnerships are productive. Nevertheless, cooperation continues approximately with half of the new partners.

Furthermore, partners are usually chosen in the early phases of a project and the project is carried out with those partners because taking new partners or changing already existing ones can do more harm than good. In addition, for Company A the potential new partner should be smaller than what they are as it would give them to be in hegemony. For instance, if a smaller partner grows bigger than what they are, the partner's motivation might lower significantly. Moreover, they believe that the partnership should be mutually benefiting as it will keep both parties motivated and conclude in better results.

In any case, the cooperation consists of both projects and long-term partnerships. There are a lot of cooperation possibilities, but the companies must be selective to choose which partnerships suit best in their needs. The more relevant the project or problem is for the companies' strategy, the more they are willing to be actively involved in it.

Also, most of the companies have start-up partners. It can be seen that Company D and Company E have start-up partners especially in the new technology sectors. Specifically, Company E is ready to acquire start-ups if it serves their own strategy. For instance, they host start-up challenges that offer start-ups a great opportunity to show their products or services and also to develop their offerings even further. On the other hand, Company B is not much directly in contact with start-ups, but the startups are present in their supplier networks. However, Company A does not see start-ups as important since most of them lack the experience that is required to avoid mistakes.

That aside, Company E mentions that events like Slush have been a great resource in Finland. It gathers many companies together and it is an excellent place to expand networks. The main event and all its side events bring many start-ups and other small companies to the awareness of the big companies. Also, they have recognized a change how networks are formed.

> *Earlier networks used to develop mostly when someone knew someone, but it has begun to change and nowadays events bring companies and offerings more to the awareness of other companies. (Informant E, Company E)*

Besides that, these start-ups might already have a product or a specific know-how that companies like Company E have been looking for. It is apparent that such gathering can also lead to interesting initiatives. On the other hand, Company D sees that it has been challenging to find those good digital start-ups from thousands of others. They receive a lot of cooperation invites but they would like to see something more concrete behind the

suggestions. Currently, they think that they need to develop their mechanisms and processes in identifying and even buying such start-ups.

Furthermore, many companies recognize that their networks have changed in time. In the past, networks used to be mostly focused on partners that can deliver certain equipment or parts. Then, today networks are turning more in a direction where data and intelligent solutions are in the center. According to Company E this means that the more traditional maritime companies must adapt and be able to transform into more technology-oriented companies. Earlier the focus was only in the ship but now the ship has become just a part of a bigger environment where data is the overarching element. As the majority of the companies represent a different business sector, of course the changes may vary depending on the point of view.

During the last couple decades, shipbuilding has been changing notably and that has changed networks of Company B. Earlier, shipyards did most of the work by themselves and they had much more of their own employees. Nowadays, shipyards have outsourced most parts of the work to subcontractors who are responsible for a certain part of the ship. This helps to secure operational preconditions and when certain assets are not needed anymore, they can be used elsewhere. As a result, many companies were established to fulfil the demand. Even though, shipyards have outsourced many functions, it has only emphasized the need to develop cooperation even further. This means that Company B has to be constantly discussing the matters with many players within its network.

On the other hand, Company C sees that the situation has not changed tremendously in their networks apart from the search for new partners and cultural differences they have faced across industries. Otherwise they have mostly had a clear picture of effective cooperation models. Then again, it is recognized that constantly developing technology requires new partners and even new networks in projects that deal with emerging technologies.

Company B thinks that the cooperation with universities has developed during the years in a more company friendly direction. This means that the starting points for research have been more concrete and aimed to advance the company's business. Yet, Company D fears that the actual readiness for change among the universities will not be sufficient. Overall, the companies still crave for a more practical approach to research that could be used in the business world.

Also, several companies complimented the new ways to act in projects, such as the SHOK-programs. The SHOK-programs differentiated from other projects because the companies had most of the influence. This meant that they could have much more influence on partner selection and the overall project goals. The industrial group of companies had a clear goal to think what requirements they might have, what should be done next and how to develop these things further.

Another area in networks that has been changing is communication. In different projects most of the communication with partners happens now in corporate platforms. Even though, these corporate platforms were earlier somewhat unprecedented, the companies have recognized the possibilities that come with them and how such platforms can enable a network to work more as one organization. Moreover, as the course of action has developed, it has enabled more advanced methods of exchanging information and that has diminished the importance of distance between companies. Many tasks can now be more easily decentralized and still be operated efficiently.

Company D admits that they spend a lot of time on coordination as different business units are spread across the world. Of course, if they would be more centrally located, it would make many things easier, but they also point out that certain collaboration tools can help in that. For example, certain ICT-tools that enable virtual conference rooms which feel like realistic meeting rooms make it feel more natural. The same seems to be working in networks where companies are now able to communicate naturally even from longer distances.

That aside, over half of the companies agreed that the distance has mostly lost its traditional meaning. The other companies argued that there are still situations where the virtual communication is not seen as good as meeting physically. For instance, brainstorming can be more challenging or the ability not to see the facial expressions or how a person reacts to this intercommunication can cause misunderstandings. According to Company C distance still has a meaning and not just in the matter of networks, but also inside a company. Virtual teams can cause challenges and face-to-face meeting are highly valued especially in the early phases of a project. In the same way, Company B sees that face-to-face meetings bring more additional value, but they also point out that things can be handled similarly from distance. On the other hand, Company A values cooperation without a long distance. They believe that the ability to speak native language can enhance cooperation. This can be the case especially among engineers or others who are not so confident in communication with a foreign language. Despite this, they do also have partners with longer distances.

Then again, Company E believes that cooperating or working remotely requires a certain attitude and it depends on the person. Some people can work more naturally in virtual environment than others but is does not take out the fact that meeting first face-to-face can increase trust and effectiveness between the actors. Moreover, Company C highlights the importance of trust in the building of relationships, and if this connection is successfully built, the virtual tools can easily enhance the cooperation to the next level.

Of course, most of the companies acknowledge the benefits of being co-located or in the proximity of a cluster but it is seen very challenging to gather all the players in one location. So, there is still the need to have networks also beyond the cluster. Company B is a good example of having both local and global networks depending of the current

needs. Being able to have local cooperation with a short distance can sometimes be valuable or more efficient, especially in the case of materials or products. On the other hand, if something is done extremely well in another location, then it is more rational to make good use of such know-how.

4.2   Why are networks relevant for maritime cluster companies

The whole Finnish maritime cluster, more specifically in the Turku area, has been attracting more and more skilled labor and specialized know-how. Company A see that this is partly because of the improved situation with the dockyard and that other big companies also have offices located in the Turku area. Additionally, this is seen to continuously spring up new discussions between different actors.

Several companies agreed that digitalizing maritime industry will require new kind of cooperation. It means that companies should combine their capabilities and create more advanced solutions together. The digitalization process has proceeded quite far already in the logistics and the freight transport will be one of the first ones to be fully digitalized. This will be followed with disruptive innovations and for that reason the companies need to adapt and improve their capabilities. They believe that the world is moving into a direction where companies aim to build networks or even ecosystems around partners from different industries and business sectors. Especially in the matter of autonomous ships, companies see that diverse know-how must be combined. According to Company D there are four different modules that are needed to build autonomous ships. Firstly, it is necessary to have knowledge about marine technology. Secondly, what is not taught with marine technology is navigation. Thirdly, what seems to be missing from the maritime cluster is ICT expertise. The fourth module consists of elements around autonomy, such as artificial intelligence, machine learning and internet of things. After all, if such competencies are not integrated, these new comprehensive solutions will be hard to achieve. So, in a cluster the companies have recognized the need to develop their networks and the lack of certain skills that needs to be acquired outside of it.

Also, many companies discuss and compare the views with universities to give and get insights about future views. The reciprocal exchange of information gives both sides valuable information that can be used to see potential future needs. For instance, companies can use ideas from universities to improve certain areas in their business. On the other hand, companies can share their views about what kind of needs might exist in the industry for students as employees in the future. Similarly, cooperation with universities has broadened their ability to think outside the box. For example, Company A organizes regularly innovation camps in cooperation with universities to offer students the opportunity to solve real business issues. Even though innovation camps have not directly

offered any new businesses, it has given them many new ideas that will drive forward their power of reasoning. In another aspect, cooperation with universities increases the amount of resources available for research as the universities can more easily do research and can have better access as they are seen more neutral than a company. Company A also values the anonymity and the confidentiality that universities maintain in their research. They can trust that their delicate information is not shared to others without permission. Moreover, Company A sees that they can consider different aspects and cooperation models multiple times better with cooperation with universities than what they could achieve alone.

Combining all kinds of know-how is typical for Company B as they need all sort skills in the shipbuilding process. They are an integrator which connects various fields of knowledge together to build big ships, and that would be much more challenging or expensive alone. As an integrator you have to constantly be aware of what is happening around you.

> *We are constantly scanning and trying to keep up what is happening in the industry. Sometimes we even have to ask around to learn what is on the way and we might also ask if they would like to do cooperation in their development work or innovation activities. (Informant B, Company B)*

The other companies have acknowledged the same principle that to build something new they need to combine their fields of know-how. Earlier maritime companies did not necessarily discuss much with others, but Company C believes that the industry is on the edge of change where maritime companies are now discussing more through networks and try to think what they could do together to gain more additional value for the whole maritime industry.

As an example of how different know-hows can be connected between two companies Company A gives an example of cooperation that can create extra value for both the customers and companies.

> *Let say that we deliver products or services to a ship, on board or for a ship operation and some other company is delivering another product or service that is related. If we can see a crossing between ours and their product or service, we can modify our product or service so that the final solution will better serve the customer as a whole. (Informant A, Company A)*

So, combining know-how can provide better solutions for the customer in a way that creates extra value. Similarly, the cooperation enables companies to build more advanced solutions together.

Overall, the companies believe that networks enable cooperation where common good can benefit all the stakeholders. This cooperation includes even cooperation between competitors. The companies recognize that this can create some extra challenges and partly limit the possibilities what can be done together, but they believe that there are many things that are better to drive forward together. This is seen as a more effective way to bring new ideas to the world. Without such open interaction, many new collaborative initiatives would possibly have not started at all or the pace would have been slower. Company B thinks that such collaborative activities will accelerate the realization of different things. Similarly, Company A has realized that cooperation will lead to better results. The more actors are working with the same problems, the better the outcome will be for everyone. On the contrary, working alone limits the ability to see the wider picture.

In the same way, Company D believes that when you share and give something to others it will multiply. Previously, companies used to promote their own things alone but in today's world it is seen more important to create links and promote together. So, when the cooperation advances their own strategy, they think it is acceptable that their competitors might benefit from it too. It is also noted that many things can be achieved faster with cooperation. Company C describes this with a metaphor of sharing a cake. If the cake becomes bigger, all the pieces become also bigger, and so everyone benefits from it. In the telecommunications, this has been the custom for a long time. The reason behind it was that they realized that if they want to aim for global markets, there has to be global standards. So, the competitors were doing cooperation to create a standard that could be become a global one. It can be seen that such open standards are rational and even competitors believe that it will benefit all, and so the cake grows bigger. The benefit in that is the creation of new business that will make their markets bigger. In other words, cooperation is important in the creation of new standards and the companies compete when they bring their new products to the market. Despite this, they see that there are still many industries where companies do not see the same benefits and have a different strategy. Those companies might just want to protect their business, especially if they already have a large market share, so they do not see need to share it with others. However, Company A doubts how far such open innovation can work. Also, they see that it is important to find a business model for all the participants as otherwise the commitment might be low.

According to Company E networks can enable access to certain specific know-how that can not be found in-house or what is not otherwise possible to have cost-effectively. Moreover, Company B is heavily dependent on its network as a lot of know-how comes from it. Besides, they need to constantly consider what kind of know-how they want to keep in-house and what could be acquired through a network. On the other hand,

Company D argues that network relationships have not been able to change enough in time to match the requirements of today. Especially in the case of autonomous ships the current know-how and competency inside the cluster are not sufficient alone to fulfill the new needs so they have look for new skills outside the cluster. The old relationships are quite far from the relationships that they have today. For instance, the relationships have shifted from component suppliers to more data-centered companies.

That aside, networks can produce new skilled labor as Company B and Company C see cooperation with academic institutions also as a good recruitment channel where they can get to know students before making the decision of hiring them. In addition, the companies can discuss with academic institutions what kind of know-how would be needed in the industry. This way they can make sure that in the future there will be enough workforce with sufficient know-how. The companies seem to be interested in academic institutions especially in the nearby area or even further away if the education matches their needs. Moreover, Company C sees that the good relationships with research groups have opened more contacts with students and the majority of the recruited people has been found through university contacts and external cooperation.

Almost all the companies mention that cooperation with others can create new ideas and solutions. This is the case especially for Company B as most of the new ideas and technological advancements come from its network. Many of their customers want to be forerunners, so projects like One Sea can help them to understand where the world is going. Another essential point that came up was that companies can be involved in projects where the core problem can differ vastly from the companies' main business. It can be these smaller innovations that are just part of a bigger solution that can interest many companies. Moreover, through cooperation in networks the companies believe that they can make maritime industry more efficient. This also means new services and products that will create extra value to the end-users.

Exchanging knowledge between partners can be seen as one of the reasons for cooperation with other companies.

> *We have understood that we do not know enough about other industries. That is one of the reasons why we are involved in these projects and we want to learn more so that we could also help those other industries to digitalize. (Informant C, Company C)*

Even though it will take some time, they find it positive that during the last couple years there has been clearly more cross-industry cooperation in their sector. There has also been a change in what knowledge companies see valuable. Company E explains how data and information can now enhance their processes. So, they want to learn to understand how things interact.

Earlier we cared more about just the technical things, whereas now we want to learn and understand how things that come from elsewhere can influence the bigger value chain. (Informant E, Company E)

In any case, the companies seem to seek new viewpoints and every now and then such viewpoint might come as a result of external cooperation.

All the companies agreed that in a way networks can lay a foundation for some legislations. As the maritime industry is particularly regulated, all the companies want to participate in the discussions about the new rules and regulations. They have a constant discussion with various authorities, classification societies and other parties about the current regulations. For example, according to Company B many of their products might be challenging because the current rules are not directly applicable to them. So, they need to discuss how such regulations could be changed. In the same way, the companies recognize the power of cooperation when they need to build new standards. If one company tries to build a new global standard alone, it will not probably be a success as other companies might also be building their own standards. Yet, together that might be possible. For example, Company E mentions that that could happen with the new integration standards.

If we can create these integration standards together with the other big players and introduce those on the market, I know that after a while those would become the global standards. (Informant E, Company E)

In a similar way, the companies believe that the new remote piloting legislation would never have been materialized without the cooperation of all the companies in One Sea project. Moreover, Company E believes that in the near future standards and interface standards between different devices will become more and more essential. Therefore, companies need work together with such issues, because they fear that if authorities try to develop such standards alone, it will take much longer and the result might not the best one. Another advantage that networks enable is the possibility to speak more easily about subjects in front of crowds, for example, speak about autonomous ships to all flag states. This is due to the fact that the company is representing the whole network instead of just a single company.

It is much easier for us to say that it is One Sea who is coming to speak instead of a single company that could hold a subjective advantage. So, networks can gain you an easier access to places, and that is also much

> *more acceptable because you represent a bigger ensemble of the industry.*
> *(Informant D, Company D)*

Overall, the companies believe that it is much easier to influence things through network than as a single company. Many companies also participate in workshops where they discuss about the future guidelines of the maritime industry.

More than half of the companies admitted that participating in a project such as One Sea can lower their costs. Such cooperation can also enable smaller companies to participate which would not have by themselves the resources to do similar research. Among other things, the companies mentioned that sharing costs among the participating companies means that they can get more value for their investment. In a similar way, the cost of participation can be seen very affordable when compared with the value of media coverage. In any case, it seems that there can be many reasons for cooperation and lowering costs could be seen as one. That aside, Company E has some experience also as an integrator because their customers highly appreciate their experience and network partnerships. For example, if a customer wants to build a ship with an unfamiliar shipyard, Company E can make good use of their relationships to ensure that everything goes as planned. So, it could be seen that networks can also lower some risks.

4.3 What kind of know-how should maritime clusters contain in the future

The companies recognize that the maritime industry is on the brink of change where new technology, innovations and environmentally friendly solutions are starting to materialize. This will require a new set of skills and competencies what the current maritime clusters partly lack. Moreover, the companies mention that the problem field of maritime industry is vast as there are numerous things that could be improved here and there. However, it is commonly seen that things are on the right track as there is a constant discussion going about the future developments. Nevertheless, the discussions are still in progress but also progressing. Of course, all the companies have their own preferred agenda but what they have in common is the desire to develop the whole maritime industry. This could be achieved through these ongoing discussions.

Even though Finland is not a significant shipping country, it has still attracted many companies because of pioneering in marine solutions. Several companies admit that Finland is partly a stepping stone as their main market is elsewhere. Despite this, Finland is seen as a great place to develop things before going to global markets. Besides, many maritime companies have agglomerated close to each other, and there is already plenty of know-how in the Finnish maritime cluster which has created a favorable environment

for developing things. Especially Company D wishes that Finland became more profiled and would make greater political statements. This could mean for example more environmentally friendly solutions such as a transition to fully electric ferries.

Another essential point that Company D think needs development is the commercial expertise. They believe that companies should be more ambitious and aim for bigger growth. This could be achieved if companies would be bolder and think outside of the box. Yet many companies settle for just small improvements in their area of business, whereas they could be creating totally new areas of business. So, there is a wish that companies operating in Finland should also be more actively seeking new opportunities, even when their main businesses would be currently doing well.

For centuries, the world has been changing and those changes have always required skills of a new kind and maritime industry is not an exception to that. The majority of the companies recognize digitalization as one area where they need improvement. The constantly increasing digitalization will have an impact on maritime industry, and for that reason the whole industry will need people with new skills and competencies. According to the companies, technologies like artificial intelligence, machine learning and internet of things will become more significant in the near future. Moreover, Company E believes that the different fields of know-how must be combined in the future.

Similarly, Company C has recognized that the maritime industry has started to wake up to digitalization. Some companies have been even recruiting ICT-experts to ride the crest of the digital wave. Furthermore, Company C believes that there is a lot of potential in digitalization and the overall trend is positive. On the other hand, they have to admit that overall not many industries understand digitalization yet. They describe the current situation in the following way.

> *If the regulation requires companies to digitalize or to do something else ICT-related, then they will usually do it, but otherwise they do not know about the opportunities that digitalization could enable for them. (Informant C, Company C)*

Therefore, Company C wants to help other industries to understand how they could benefit from digitalization and how they could combine different fields of know-how. In addition, it can be seen from the interviews that other interviewed companies have started to understand the importance of digitalization. It will also create a need for new visions about the future as Company D ponders:

> *The world is moving in a direction where services are going to platforms and everything is going to be globalized. So, if you are just looking into your mechanical doing you might not even notice your future customers.*

> *Perhaps we could use a more digital world view that would allow us respond better to constantly changing business models. Because your current customers might even not be your future customers. (Informant D, Company D)*

In addition, the majority of the companies mention that several IT system improvements could enhance their business. For example, the companies believe it would be important to integrate systems so that those could communicate better with another. Specifically, Company C explains how ships can contain numerous systems that can not interact with other systems. Practically it means that the system signals an alarm and then someone has to react to it as well as do something probably in another system. This is an area with a room for improvement as Company C explains.

> *In most cases companies have not shared information with others and they have just made their own products. When those systems go into ships, those will not probably be able to interact with the other systems. Here we see a lot of potential to do cooperation with companies in maritime industry because we could, for instance, do system standardization with them and help them to make their systems communicate with each other. (Informant C, Company C)*

In addition, Company D mentions that several IT-related solutions could increase the effectiveness of supply chains. For that reason, also the flow of information could be automated inside the value chain. In a similar way, Company B highlighted the need to combine different areas. Many things like information or data processing are still seen challenging even though those areas could enhance their business. A few companies add that collaborative tools could improve cluster activities. Such tools could enable communication and sharing knowledge or documents with multiple parties. One problem that seems to still exist in clusters is the lack of trust. Commonly, if companies could be more open, they could develop more advanced activities. Moreover, Company D believes that new technologies such as blockchain could suit well for cluster-based activities because then parties could share confidential information and control better who is able to view it. To put it in another way, Company D believes that clusters or even networks could benefit from tools that could enhance transaction management.

Ethics is another important area regarding systems that will need development in the future. Especially, in the case regarding autonomous ships, the companies believe that there must be a right ethical reasoning behind it. This again, could require a totally new kind of know-how in maritime clusters. Furthermore, the ethics would need to be based on some regulations and clusters could offer a platform for such collaborative activities.

The majority of the companies are worried about the recent cuts in funds. They mention that project funding from government is very important for them, so that they would be able to initiate or participate in collaborative projects. These funds formerly made possible, amongst other things, bigger cooperative initiatives. Moreover, the companies think that the recent cuts that the government made in education have directly affected the quality of the research done by universities. The companies fear that in the long term this can affect their chances to find necessary competencies. Therefore, they believe that there should be more investments in education especially in areas that are important to Finland.

The cooperation with universities divided opinions as some of the companies thought that they had found the right channels and methods and were mostly satisfied with the current situation, whereas some of the companies were hoping for more changes. Overall, it could be said that the biggest concerns were related to the universities' ability to change fast enough. The world is changing around the universities with a growing pace and several companies fear that the universities have not been able to reform strongly enough. The traditional research model is not seen as the most effective model because the companies seek more concrete, faster and practical models. In the same way Company D has doubts about the universities' ability to change but they believe this could be overcome if the universities would just refresh their habits. According to them, especially in the Turku area, everything necessary already exists. Moreover, there is no need for any new educational institutions or organizations. It would just need a desire to cooperate and the willingness to share the honor.

On the other hand, constant discussions with many academic institutions are highly valued. Company B thinks that this open discussion has helped them to learn each other's opportunities and needs. This way they can influence and secure that there will be also enough right kind of know-how and skills. Furthermore, there is a wish from the companies that more digital sections would be included in the education. For instance, schools could integrate more digital sections into shipbuilding education to support the growing need for such know-how. That aside, the companies also hope that the research would focus more on areas that could have a bigger impact on the whole industry. They would like that the focus would be on areas that would have the biggest possibility to influence the whole business.

When it comes to the cooperation with students, Company A hopes for more cooperation with master's students. They see that master's students already have certain skills that are needed in working life and such potential should be channeled better. Overall, they are satisfied with the cooperation with universities and they think that maybe the target for development could be to improve the research coordination.

Another key point to remember is different project models. According to the companies they have been doing cooperation in various project models, but many models lack the concrete results that the companies are seeking for. For example, the EU-projects were

mostly not seen as practical because of the waterfall pattern that is not agile nor will it allow the companies to change their focus enough during the project. On the other hand, the SHOK-program received praise especially from Company C. According to them, that has been the best project model so far. Moreover, the SHOK-programs had a higher-level agenda, were practical and resulted in concrete results. For those reasons, Company C hopes that there would come a similar model or then the old SHOK-programs should be introduced again. In a similar way, Company B wishes that the research projects with universities were more practical.

In the same way, the majority of the companies recognize a need to develop cooperation models as the current situations are hardly seen as the most effective ones. Despite this, some of the companies have doubts about being more open. To illustrate, Company A highlights a current problem in cooperation as in Finland there is a lot of maritime expertise among companies but most of them are either directly or indirectly competing against each other. Company A see that the current know-how is developed so far that it can be hard to find cooperation possibilities as most of the companies want to already turn their knowledge into similar products. They do not know, what would be the next step as the current cooperation model between universities, companies and government would need to be updated somehow.

So, developing current cooperation models is seen essential and some of the companies believe that perhaps the next step could be to combine and manage new competencies. Company D pointed out that many emerging technologies require combined competencies, and one company can hardly master such areas. Moreover, directing such combined competencies would possibly require a new education as currently there is an emerging need for know-how that could help to manage competencies from different fields. Furthermore, there is a need for new study modules that would combine different fields that would be required in the future. Complementary to this Company A hopes for better dialog between different companies that are offering related products or services so that final product or service could be designed based on how the two products or services can influence the final outcome together. Moreover, Company A feels that the know-how about what the shippers actually do on board with the cargo should be more integrated in their product and service development. In other words, the companies have acknowledged that the maritime industry would need new know-how to manage constantly developing innovations.

More importantly, the companies believe that the maritime industry could use new insights from different industries and it would benefit all, if such companies could be brought to their industry. Especially companies related to technology could bring in new technological advancements that could be mutually beneficial for everyone. According to Company E even companies that operate in totally different business sectors could give valuable new insights. All things considered, the companies believe that creating new

structures and networks is important. These networks should also reach outside the maritime industry so that new players could be found. Overall, the companies believe that the technical competency in Finland is more than sufficient, but they still need to learn to utilize competencies from different fields of business.

5   CONCLUSIONS

The purpose of this study was to investigate *how companies in maritime clusters are networked*. The sub-objectives were 1) how are companies and stakeholders networked 2) why networks are relevant 3) what kind of know-how should maritime clusters contain in the future. In the following chapter, the findings will be reflected on the theory to find similarities and differences in the current literature. The second chapter will present findings from managerial perspective. The third chapter will discuss the limitations of this study. The fourth chapter will present potential future research opportunities that have emerged from the material in this study.

5.1   Theoretical implications

This study focused on companies that operate in the Finnish maritime cluster. The Finnish maritime cluster includes multiple international and domestic companies that have agglomerated in close proximity. One reason why Finland has attracted so many global companies seems to be favorable conditions in addition to extensive know-how. As explained by Porter (1990) in his diamond model about the determinants of competitive advantage, the Finnish maritime cluster seems to have determinants that attract companies. Therefore, many companies see Finland as a great location to develop things. Even though the role of location in its traditional meaning has been changing, it still has an important role in the creation of competitive advantage (Porter 1998a). In addition, several companies agreed that being located close to others has its advantages (Connell et al. 2014; Porter 2000; Porter 1998a). However, half of the companies believe that technological advancements can partly substitute the distance between different actors.

Nevertheless, being located in a cluster opens access to skilled labor (Porter 1998a) where public institutions have an important role to educate students to cluster related jobs (Porter 1998b; Patti 2006). For that reason, many companies value the cooperation with universities and other academic institutions because it can yield, for example, future employees for them (Carrie 2000). It is apparent that such cooperation is mutually benefiting when both the companies and academic institutions can exchange information regarding the newest industry trends.

Several studies (Günther & Meissner 2017; McCann & Folta 2008) have pointed out how clusters can produce knowledge spillovers. The findings support this as collaborative activities can broaden companies' knowledge, for example, regarding industry knowledge or future trends. Besides knowledge spillovers, companies that are located in a cluster or have networks can gain access to information that would be otherwise out of

their reach (Porter 2000). The companies think that it is important to have such collaborative activities.

Previous studies (Porter 1998b; Patti 2006) have identified how representing a whole cluster can open more resources than what a single firm could possibly acquire. In this study similar findings were found in networks since being part of a bigger entity can allow you to speak more easily in front of crowds, and therefore gain you access to places and resources that would really be challenging to access as a single firm. In the same way, all the interviewed companies admitted that it is much easier to influence, for example, authorities regarding new legislation when you represent a network. Similar findings have been found in the cluster and network literature (Porter 1998c; Patti 2006; Persson et al. 2011). Besides the cooperative network activities, the companies also have their own discussions with various authorities and organizations. In addition, this constant discussion can help authorities in their decision making since the companies can share their knowledge and expertise about the current topics.

When it comes to cooperation between companies, the literature suggests that most of the cooperation occurs at vertical levels (Porter 1998a; 2000; Maskell 2001). However, the findings challenge the idea as there was also evidence of horizontal cooperation between direct competitors. According to Patti (2006) such activities can take place when there is an external threat to the cluster. Another reason for such cooperation could arise from common interests (Carrie 2000). In this study was not found any direct external threats but perhaps the companies have shared interests and have recognized that the newest technological advancements in maritime industry would require unprecedented cooperation modes that would break the traditional boundaries. That aside, cluster members can also be vulnerable to distorted view of competition when they are too inward looking. This can start to decelerate the abilities to innovate (Porter 2000; Pounder & John 1996). No such findings were discovered, but on the contrary the companies have acknowledged that they need new insights and partners outside the maritime cluster. Moreover, the companies want to expand their networks as they have recognized that their current networks lack certain know-how and skills that they would need. This is supported by the findings of Wilkinson et al. (2005) why firms tend to cooperate and form networks. To put it differently, firms want to cooperate with other partners to complement their core competencies.

In addition, networks can arise from cooperative activities between two members. This personal relationship can then expand to a group of members that have common interests (Klein & Perreira 2016; Eklinder-Flick et al. 2012). On the other hand, the findings of this study suggest that also events play an increasingly important role in the formation of new networks. Furthermore, what binds together all the interviewed companies is their aligned goals, a desire to develop the maritime industry and at the same time develop their own businesses. Moreover, Kogut (2000) has argued that characteristics of an industry

can determine the level of cooperation between firms. According to his study industries that are technology focused tend to cooperate more than industries that are protecting their operational knowledge. In a similar way, perhaps the digitalization and new technologies have been driving the maritime industry towards a more technology focused industry which promotes more cooperation.

Finding the right partners is essential for a successful cooperation (Niu et al. 2008; Wilkinson et al. 2005). More importantly, two important factors in partner selection have been past experience and trust (Ireland et al. 2002; Kale et al. 2000; Gordon & McCann 2000). The same criteria seemed to be important for the interviewed companies. To elaborate, external projects or minor collaborative activities were seen a great way to start building trust between different actors.

Networks can allow companies to share costs, know-how and other resources between several parties (Munksgaard 2015; Kale et al. 2000; Van den Berg et al. 2001). In this study, over half of the interviewed companies agreed that cooperation can lower their costs or offer more value for the investment. When it comes to sharing know-how, the companies have recognized that they still need to develop current cooperation models. Sharing know-how always involves some risks but is important for learning and innovation (Kale et al. 2000). The companies are aware of potential opportunistic behavior and yet, the companies believe that they can achieve more and faster if they are more open.

Persson et al. (2011) expressed the opinion that one purpose of RSNs is to develop cooperation among different parties. Some of the findings suggest that projects such as Tekes-projects or other projects supported by the government offer the companies, amongst other things, a possibility to form new connections to other companies. In any case, Andresen et al. (2012) have suggested that the commitment is related to the period of time available. For some reason, most of the government or state funded projects seemed to have a much shorter time span than private projects but the findings did not show if a shorter time span is related to the level of commitment. Moreover, the companies showed to prefer both short-term and long-term cooperative activities. Furthermore, in network literature (Munksgaard 2015; Persson et al. 2011) the commitment is often linked to how aligned are the personal and common interests. The findings show similar results as the companies stated that it is important that all other partners are also satisfied. This can be achieved in cooperation when partners can find a business model for them and are therefore well motivated.

The maritime industry has primarily global markets (Benito et al. 2003). It became apparent that almost all the companies have also international networks that reach far outside the Finnish maritime cluster. On the contrary, some of the companies admitted that even though they are located in the Finnish maritime cluster, they think that their networking in the cluster has so far been limited and could be improved. Zhang and Lam (2013) have made similar findings suggesting that not all maritime cluster members are

networked together. Several studies (Jenssen 2003; Njøs et al. 2017) have pointed out how important especially external cooperation is for maritime clusters. The findings support this as most of the companies actively seek new partners also outside the maritime cluster. It can be seen that there are new technologies outside the maritime cluster that the companies want to utilize. Complementary to this, innovativeness in maritime industry has been identified as one of the key factors for cooperation in the high-cost countries (Jenssen 2003). Similar findings have been made in this study as the companies have acknowledged that they need to combine their know-how if they want to be innovative especially in the areas of new technologies.

Traditionally, have the two essential roles of maritime clusters been to develop networks and enhance innovativeness (Dikšaitė & Viederytė 2014). The findings suggest that perhaps the development of networks is shifting from traditional supply chains to more technology-oriented networks. Moreover, it seems that some of these new networks aim mainly outside the maritime cluster. Likewise, Jenssen (2003) has proposed that maritime companies should develop more cooperation with other industries, such as the ICT industry. Based on the findings can be argued that the companies are getting more aware of the possibilities with other industries. Also, most of the companies emphasize the importance of ICT in the future.

5.2   Managerial implications

Networking in maritime clusters consists of both local and global connections. The companies seemed to be doing cooperation in multiple fields with various stakeholders. The networks comprised other companies, organizations and academic institutions which all have their own purpose. Even though many stakeholders were in close proximity, there were also other factors that contributed to the selection of new partners. In addition, it was seen challenging to gather all the necessary players in one location. Besides, today's technology can enable intensive cooperation even from longer distances.

It is apparent that the newest technological advancements in maritime industry will require new forms of cooperation. It can be seen that companies are looking for more cross-industry cooperation to combine different fields of know-how. The findings suggest that it can be even beneficial to be involved in projects that are not directly related to a company's core business. To elaborate, participating in such projects can yield smaller innovations or broaden their knowledge about other industries.

When it comes to finding new partners both the literature and findings suggest that trust and past experience are valued factors. In addition, companies seem to be constantly screening for new partners and new forms of cooperation. Subsequently, one decisive factor was related to how well the companies' interests align. Another essential point is

the importance of events in networking and finding new partners. The events can connect companies from different networks together.

The external cooperation is especially important for learning as networks can transfer new knowledge. It can be seen that the companies have multiple networks that can consist of various stakeholders. As an example, the cooperation between companies and academic institutions can be mutually benefiting in multiple aspects. The knowledge sharing can offer both parties the latest information and generate new collaborative activities. Besides that, the constant discussion with academic institutions can ensure the continuity of skilled employees also in the future. Based on the findings the cooperation with academic institutions and the research that they conduct is valued but it is by no means self-evident that the companies will find the right channels for such cooperation as the relationship will require both resources and time to develop.

It seems that the maritime industry is developing in a direction where current partners and networks are not sufficient alone. The latest trend seems to be networking outside the maritime cluster as many companies are looking for a specific knowhow that the cluster is currently lacking. Therefore, it would be relevant to build more cross-industry networks where know-how from different fields could be combined and utilized in maritime clusters. In addition, it was noted that in time the networks have been evolving. That aside, it is also important to continue discussions with authorities as new technologies will require new regulations. It can be seen that cooperation even among competitors will be crucial, for example, if the goal is to create new standards. This will be emphasized in the near future when more and more devices will be connected together. Similarly, the cooperation among competitors can be profitable if it aims to grow the overall market.

It can be seen that the understanding about the possibilities of digitalization is possibly increasing among maritime companies as the majority recognized digitalization as one area that will require improvement. Consequently, the importance to utilize new technologies and know-how will be highlighted in the future. It is apparent that it will possibly require new forms of cooperation and networks to achieve such development. The common opinion among companies supports this as they see that combining offerings or know-how can create more value for the whole maritime industry. To elaborate, most of such know-how could exist outside the maritime cluster. For instance, certain start-ups could bring about new expertise into the maritime industry. On the other hand, it seems to be challenging to find good alternatives among various start-ups. In addition, one downside of start-ups might be their lack of experience.

Based on the findings it could be argued that the cooperation between companies and academic institutions could require some form of enhancement. Overall, the cooperation was highly valued but commonly the companies seemed to approach problems from slightly different and more practical viewpoints. There was no evidence why in maritime clusters the importance of such cooperation would diminish in the near future. On the

contrary, the cooperation with academic institutions can be seen essential if the companies want to remain innovative.

That aside, it must be noted that the economic support from government is essential for the companies as it has enabled many of the collaborative activities. The recent cuts have raised fears as the companies are dependent on the government's support. The same support can be seen crucial for the development of new knowledge in the maritime clusters. Additionally, the new knowledge could be channeled more effectively with emerging technologies that would allow improved information exchange among cluster participants.

It has been shown that the companies are networked to multiple stakeholders and even do cooperation with direct competitors if it serves their strategy. The starting points for cooperation in networks seem to be welling up from the common interests in addition to a desire to combine different competencies. Additionally, the networks produce new knowledge to its members that can be used for value creation. Nevertheless, it is apparent that current networks are not sufficient alone for the future demands as digitalization and new technologies will require new kind of know-how in maritime clusters.

5.3   Limitations of the study

It is acknowledged that there are various limitations in this study. To elaborate, clusters and networks are vast concepts even when properly narrowed. For that reason, the findings based on only five interviews can not give a comprehensive view about the maritime industry. Even though the interviewed companies represent different sectors of maritime business, more companies from different maritime sectors should be involved to get a more comprehensive view about the maritime industry. It must be noted that it can be challenging to generalize the findings in a wider context because more research is needed.

Complementary to this, the framework of this study was focused on the participants of One Sea project. Hence, the interviewed companies represented different maritime sectors, it must be emphasized that some of the shared opinions could be explained by the involvement in One Sea project. Considering that possibility, it can be possible that these companies are involved in the same project because they share a similar view about the industry. Despite this, also some differences in answers were noticed. Anyway, it would be important to consider including other companies and stakeholders from varying backgrounds to ensure that the responses would represent the whole industry which could lead to even richer interpretations.

Another factor that is important to acknowledge is the nature of qualitative research in addition to the semi-structured interviews as most of the findings are based on the researcher's interpretations of the studied phenomenon. Moreover, the qualitative research

suits well for studying and exploring a phenomenon for the first time. To get more comprehensive results, the qualitative research should be combined with quantitative research. The quantitative research methods could be used to further study the relationships that companies have between them and how vast their networks are.

5.4   Future research opportunities

This study focused on investigating companies in the maritime cluster. It would be interesting to conduct a similar study with a larger number of interview participants. As in this study only five companies were interviewed, it could offer a more comprehensive view about the subject if more companies and other stakeholders that were identified like organizations and academic institutions would be interviewed. In addition, the maritime industry is comprised of companies in various sectors and only companies from few sectors were present in this study. It would be interesting to see how other sectors that were not dealt in this study would view about the same subject. For instance, parties like shipping or liner companies, ferries, harbors and ship design companies should be included.

Based on the findings of this study there were identified several future research opportunities. As it was identified in this study, the cooperation between direct competitors would require further research to understand what the conditions for such activities are and will that become more common in the future. Other subjects that could definitely require further research are related to the structures of maritime networks and how companies could combine various skills and know-how in the future. Then again, investigating the role of start-up companies in maritime industry could also offer a new perspective to how companies are networked.

To summarize, the contribution of this study has pointed out several possibilities for future research. The maritime industry is developing and so are its networks and clusters. Therefore, it would be important to study the same phenomenon with a bigger sample of maritime companies and stakeholders. In addition, several other topics have been recognized that could need further research.

6 SUMMARY

The main research object of the study was *how companies in maritime clusters are networked*. From the cluster perspective it can be seen that the whole Finnish maritime cluster has attracted companies from various maritime sectors because of favorable conditions and know-how. It is seen as a significant location to develop things in collaboration with other stakeholders. In addition, the companies seem to have both local and global networks that contribute to value creation. The companies have also recognized that the current networks are not sufficient alone in the future as the maritime industry is constantly developing. The new innovations will require a new set of skills and competencies that can be challenging to find inside the maritime clusters, so companies need to broaden their networks to find suitable partners.

The first sub-objective was to investigate *how are companies and stakeholders networked*. Based on the findings it can be said that companies do cooperation with several stakeholders in multiple sectors. In addition, it was recognized that companies do cooperation even with direct competitors if their interests are aligned. Moreover, another key reason for such activity was to develop the whole maritime industry faster through combined resources and know-how. The cooperation was not limited to companies only as there is continuous cooperation or discussion going with academic institutions and organizations. Therefore, network relationships with partners are seen important. However, selecting partners requires certain partner characteristics such as trust and past experience that were identified to be important for companies. These characteristics influence the choosing process as previous experience, trust and common interest are highlighted. Overall, it can be seen that digitalization and new technologies are enhancing the collaborative activities of the whole maritime industry. As a result, companies are looking for new partners with various competencies especially outside the maritime cluster.

The second sub-objective was to understand *why are networks relevant for maritime cluster companies*. The importance of networks is highlighted among maritime clusters. Networks can provide new information that can be used for value creation. In other words, competitiveness can be improved through networks as a result of cooperation. Also, cooperation with different actors, such as universities, can broaden the ability to approach things from new perspectives. More importantly, companies can have bigger influence on matters if they represent a network instead of a single entity. In the same way, networks offer a possibility to share costs and resources that can be mutually benefiting.

The third sub-objective was to understand *what kind of know-how maritime clusters should contain in the future*. One of the main findings was that there is an emerging need for more cooperation with other industries. Companies have become more aware of the possibilities and recognize the importance of cross-industry cooperation. Also, more open dialog between different actors is needed. Moreover, digitalization was highlighted as one

area that will require further development as currently the companies in maritime clusters are not yet fully utilizing all the possibilities that new technological advancements could enable. That aside, companies were mainly satisfied with the current level of cooperation with academic institutions, but they still wish for a more practical approach to problems.

To conclude, companies in maritime clusters seem to be networked in multiple sectors. Companies' reasons for cooperation can be based on common interests, new knowledge or resources. However, potential new partners must meet certain requirements. It can be seen that the developing requirements of maritime industry seem to be promoting new networks and partners to match the future needs. This will highlight the importance of networks with the right capabilities in the future.

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APPENDICES

Appendix 1 The interview questions

1. What kind of networks relationships does the company have in the Finnish maritime cluster?
2. What kind of know-how has been connected with different actors?
3. How have network relationships changed over time?
4. What kind of know-how should or could be connected in the future?
5. What kind of network relationships are the most important for the company?
6. How do you choose partners?
7. What kind of relationships does the company have with academies?
8. How do you choose these partners?
9. What kind of cooperation does the company have with academics?
10. What interchanges in the cooperation?
11. What does the company gain from cooperation?
12. How has the cooperation affected the company's business?
13. How has the cooperation developed over time?
14. How could the cooperation be improved?
15. What kind of resources or benefits can be achieved through networks?
16. How does distance or location affect networks?
17. What sort of roles do the different members of One Sea project have?
18. What could be developed from this cooperation?
19. How did the company join this project?
20. What the company tries to achieve in it?