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Higher competitiveness for the port call process within the port community

A qualitative case study about how to increase the competitiveness for the port call process in the Port of Gothenburg

Master's thesis in Quality and Operations Management

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Cover: Distant view over the container terminal in Gothenburg.

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Abstract

In order for the *Port of Gothenburg* to strive towards achieving the vision of being the obvious freight hub in Scandinavia the port wishes to strengthen their competitive position and reduce the cost associated with the port call process. Further, the *Port of Gothenburg* is an important actor for the Swedish industry and economy, hence it is important to assure that the competitiveness is high since, as stated by Robinson (2002), the ports today are operating in a competitive environment. In order to stay competitive it has become increasingly important to consider the whole supply chain and maximise the whole chain's profit (Zhang et al., 2013). Moreover, since price and quality are important components for competitiveness (Oxford Dictionary of Economics, 2013) the researchers of this master thesis believe that quality principles are suitable to use to increase the competitiveness for the port community of Gothenburg. The purpose of this master thesis is therefore to investigate how higher competitiveness can be achieved in the arrival and departure process for container vessels within the *Port of Gothenburg* from a quality perspective. Since there are many actors involved the purpose is to investigate how the competitiveness can be increased for all actors in the port community. The study has been limited to the port call process for container vessels. Due to the nature of the problem and the formulation of the purpose a qualitative research strategy and a case study design was chosen for this project. In the empirical findings the result from the interviews is presented and it was revealed that correct and reliable information, good communication when changes occur, safety, high availability to the quay and punctuality and so on are prerequisites for smooth and efficient arrivals and departures. In the analysis and recommendation some proposals are developed and described. The first proposal is to start collecting data and measure estimated time for departure and actual time for departure in a structured way. Second, the stakeholder relationship should be evaluated. Third, increasing the level of collaboration between stakeholders through establishing quality meetings. Fourth, establish clear routines for communication and information sharing. Lastly, in order for the other suggestions to be successful there is a need to strive towards higher transparency.

Keywords: *Competitiveness, competitiveness in ports, port community, quality management*

Sammanfattning

För att möjliggöra för Göteborgs Hamn att sträva mot att uppfylla sin vision att *”vara det självklara godsnavet för sjötransporter i Skandinavien”*, önskar hamnen att öka sin konkurrenskraft och sänka kostnader relaterade till anlöpsprocessen. Göteborgs Hamn är en viktig aktör för svensk industri och ekonomi, därför är det viktigt att säkra att konkurrenskraften är stark, vilket även Robinson (2002) anser eftersom hamnar idag befinner sig i konkurrensutsatt omgivning. För att vara konkurrenskraftig har det blivit ännu viktigare att ta hänsyn till hela leverantörskedjan och maximera hela kedjans lönsamhet (Zhang et al., 2013). Vidare, eftersom pris och kvalitet är viktiga komponenter för konkurrenskraft (Oxford Dictionary of Economics, 2013), ansåg forskarna i detta arbete att kvalitetsprinciper var passande för att öka konkurrenskraften för hamnen och dess aktörer i Göteborg. Därför var syftet med denna master uppsats att undersöka hur högre konkurrenskraft kan uppnås vid ankomster och avgångar av containerfartyg i Göteborgs Hamn från ett kvalitetsperspektiv. Eftersom det är många aktörer involverade vid en ankomst och avgång var syftet att undersöka hur konkurrenskraften kan ökas för alla aktörer i hamnen. Studien har varit avgränsad till ankomst- och avgångsprocessen för containerfartyg. Med hänsyn till karaktären av problemet och syftet med studien, valdes en kvalitativ forsknings strategi för projektet. I empirin presenteras data insamlad under intervjuer där det framkom att korrekt och pålitlig information, god kommunikation när ändringar sker, säkerhet och punktlighet etc. är förutsättningar för smidiga och effektiva ankomster och avgångar. I analysen och rekommendationen utvecklas och presenteras förslag på hur konkurrenskraften kan ökas. Första förslaget är att strukturerat samla data och mäta uppskattad tid för avgång och faktiskt tid för avgång. Andra föreslaget är att utvärdera relationer till aktörerna i hamnen. Efterföljande föreslag är att öka nivån på samarbete mellan aktörer genom att upprätta kvalitetsmöten. Fjärde förslaget är att upprätta klara rutiner för kommunikation och informationsdelning. Sista förslaget är att sträva för ökad transparens för att kunna lyckas med de tidigare presenterade förlagen.

Acknowledgment

This master thesis was conducted at Chalmers University of Technology, on behalf of the *Port of Gothenburg*, during the spring 2015. The thesis was performed in collaboration with *Port of Gothenburg* and their stakeholders.

First, we want to thank Åsa Kärnebro Bergström and Fredrik Rauer at the *Port of Gothenburg* for letting us conduct the thesis at the *Port of Gothenburg* and for encourage us to see the problem from our perspective and with new eyes, we appreciate it a lot. We would also thank Åsa and Fredrik for the input, knowledge and experiences from the port and shipping area, it has been valuable for us especially since we did not have any initial knowledge about the industry. The execution of the thesis has been challenging and fun for us, we have gained a lot of new knowledge and experiences, which will be useful for us in the future.

We also want to thank all interviewed stakeholders. We are so grateful and pleased for your openness and willingness to share your thoughts and ideas with us. A special thanks to the crew on Svitzer GEO, we learned a lot during the visit at the boat, it was exciting and we will remember it for the rest of our life.

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Lastly, we would like to thank all who have read our report and for the feedback you have given us. It has been valuable and helped us in order to improve our thesis.

Karin Norén and Sandra Wallgren Ekström

Gothenburg, May 2015

Table of contents

Table of figures

Vocabulary

ATD: Actual time for departure

Congestion: When cargo is accumulated at the terminal area, the area is over utilised

Con-Ro: Vessels with containers and roll on roll off

ETA: Estimated time for arrival

ETD: Estimated time for departure

GDP: Gross domestic product

ICT: Information and communication technology. In this report the Mona Lisa project and the Port CDM initiative are ICT initiatives which will be mentioned briefly

Intermodal: Using different modes of transportation during a journey

Ocean-going vessel: Also referred to as deep sea vessel

Port call: The arrival and departure to and from a port

Port community: Key actors with interrelated activities to the sea transport and the transfer to inland transports

Ro-Ro: Roll on Roll off

Shipping agent: Also referred to as agent

SMHI: Swedish Meteorological and Hydrological Institute

TEU: Twenty-foot equivalent unit, standard size of containers

UNCTAD: United Nations Conference On Trade And Development

Vessel: Also referred to as a ship. Vessels or ships transport different typed of cargo e.g. containers, roro, cars and passengers

VHF-radio: Very High Frequency, radio often used in the maritime sector

1 Introduction

In this section a general introduction to the focus area for the study will be described and then a more specific background to the specific case with the purpose and research questions. This will be followed by scope and limitations and also a short outline of the content in this thesis.

The ports today are operating in a competitive environment (Robinson, 2002) and the pressure on ports to reduce their environmental impact is increasing (UNCTAD, 2014). With this follows the challenge of figuring out how to achieve development with the least possible environmental impact. There are three areas of impacts from port operations; emissions, operations and accidental pollution. Therefore, how the port operations is managed can have great implications for the environmental impact. When it comes to containerised cargo it accounts for around one sixth of the total volume of cargo around the globe. However, it accounts for more than fifty percent of the value for seaborne trade. The world *Gross Domestic Product* (GDP) still expands and there is a strong correlation between economic growth and industrial activities. In addition, when it comes to development, the global container port throughput is increasing annually with 5-6 percent. In order to engage in international trade ongoing development of the port operations is important and changed market conditions put pressure on port development (UNCTAD, 2014). Also Alderton (2008) explains the importance of increasing efficiency in ports and increasing value-adding activities due to competition.

Today ports have to compete for cargo, basically the competition started during the advent of the intermodalism. How the port is managed can affect the competitiveness and can create an environment that is attractive for port calls for big multinational container carriers (Alderton, 2008). One challenge is that vessel size is growing, which puts pressure on ports. In order to have the capacity to handle these vessels investments are needed, for example in larger cranes and storages areas as well as assuring sufficient depth. Further, the demands can put pressure on implementing more sophisticated terminal operating systems (UNCTAD, 2014).

UNCTAD (2014) has predicted that collaboration between ports will increase in the future. In modern logistic systems it is common to have requirements for *Just In Time* (JIT), which puts demand on ports to maintain and improve reliability and also manage the cargo throughput procedures (Alderton, 2008). Moreover, according to UNCTAD (2014) the development trends regarding port operations are increasing usage of universal standards for terminal operating procedures and IT systems with the ability to connect globally (UNCTAD, 2014). In order to stay competitive it has become increasingly important to consider the whole supply chain and maximise the whole chain's profit (Zhang et al., 2013).

1.1 Background

The City of Gothenburg is the owner of The *Gothenburg Port Authority* which in turn is the owner of the land and infrastructure within the port. However, when it comes to the operations of the container, car and Ro-Ro terminals the responsibility is transferred to external operators. The *Port of Gothenburg* is the largest port in Scandinavia and it has terminals for containers, Ro-Ro, cars, passengers and energy products (Göteborgs Hamn, 2014a) and the *Port of Gothenburg* handles the largest shares of container volumes in Sweden (Göteborgs Hamn, 2015), see *figure 1 below*.

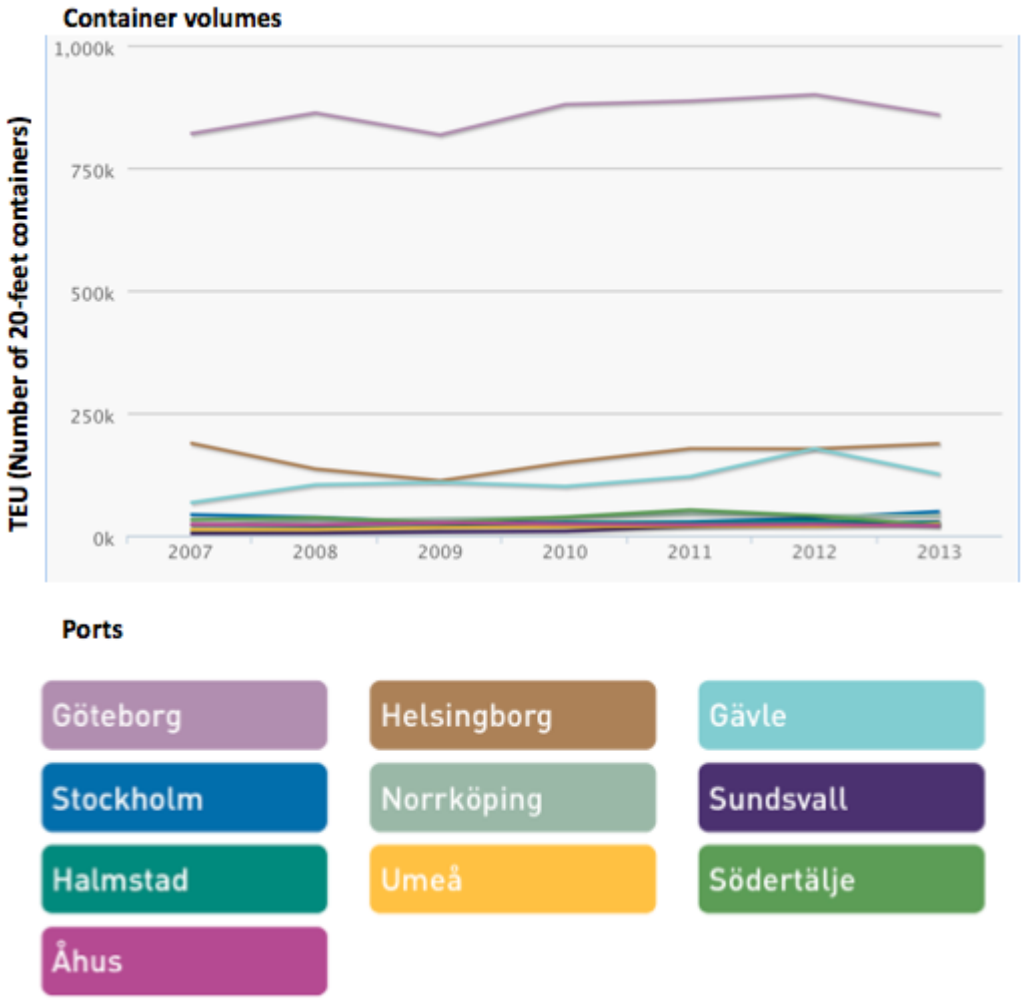

Figure 1: Container volumes for the largest ports in Sweden (Göteborgs Hamn, 2015)

In one year the port receives around 11 000 vessel calls and the *Port of Gothenburg* is the only Scandinavian port with the capacity to receive the largest container vessels (Göteborgs Hamn, 2014a). The City of Gothenburg has requirements on the *Gothenburg Port Authority* to strengthen the industry and to create competitive advantage for the Nordic industry (Göteborgs Hamn, 2014a). The goal is to create conditions to become a strong, efficient and sustainable Scandinavian freight hub. The vision is formulated as; "*The Port of Gothenburg will be the obvious freight hub for sea transport in Scandinavia"* (Göteborgs Hamn, 2014a) and the four core values are; reliability, co-operation, innovation and sustainability. Reliability is about ensuring smooth operations and delivering on promises, co-operations concerns creating value for the customers as well as building partnerships, innovation is about finding new ways and using new ideas and sustainability concerns being able to operate in a long term perspective as well as taking responsibility for future generations. Further, the *Port of Gothenburg* is supposed to be a logistical centre for national freight in order to strengthen the position for the City of Gothenburg nationally (Göteborgs Hamn, 2014a). The first quarter of 2015 it was a five percent loss of volumes compared to the same quarter the previous year for the container terminal in Gothenburg (Ovesen, 2015), *figure 2* below also shows that the container volumes have declined in the last years (Göteborgs Hamn, 2015).

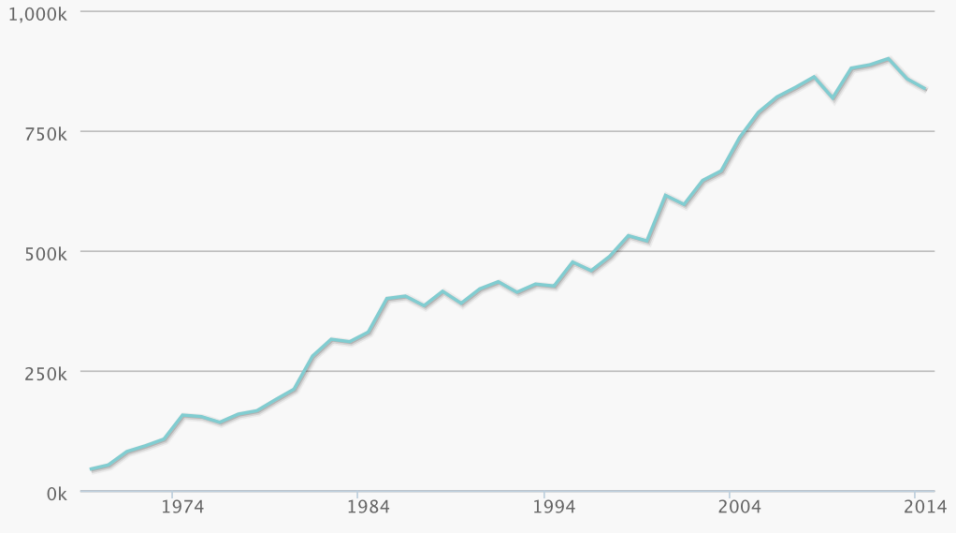

Figure 2: Volume trends in TEU for the Port of Gothenburg (Göteborgs Hamn, 2015)

It is therefore increasingly important for the *Port of Gothenburg* to develop and to increase the competitiveness. Today there are challenges related to the port calls to the container terminal. The purpose of this master thesis is therefore to investigate how higher competitiveness can be achieved in the container arrival and departure process by conducting a qualitative case study. Within the port call process there are many actors involved such as pilot, linesmen, towage and so on. Therefore, the focus is to investigate how the competitiveness can be increased for all actors in the port community. In this report we have chosen to use the definition of a port community defined by Thomas and Martin (2001) "*A port community is defined as those key commercial organisations whose combined services support the function of a port to transfer cargo between marine and inland transport modes.* " (Thomas and Martin, 2001, p. 280). This definition include five organisational groups; providers of port infrastructure and facilities, providers of cargo handling services, maritime transport operators, inland transport operators and representatives of the cargo (Thomas and Martin, 2001, p. 280).

From an academic perspective the thesis is relevant since maritime literature in general mostly cover improvement of technical matters such as development of fuel and energy efficiency (see for example Chapman, 2007; Johnson and Styhre, 2014), cargo handling efficiency (Athena Information Solutions Pvt. Ltd, 2011) and IT solutions (Larsson-Steen, 2012). Johnson and Styhre (2014) identified a need for investigating practices rather than principles on efficiency in ports. For example, how the communication between the shipping company and other actors looks and how it affects the efficiency and how cooperation for speed reduction can be achieved (Johnson and Styhre, 2014). Moreover, there are many studies which have used quantitative methods in order to assess the port competitiveness in different ports including; inter linear programming, dynamic programming, analytical hierarchy process, stochastic frontier analysis, data envelopment analysis (Yap, 2009; Notteboom and Yap, 2012). Quantitative methods are the most applied methods to measure competitiveness in ports (Yap, 2012). Nonetheless, these methods are restricted to aspects of competitiveness which are measurable (Notteboom and Yap, 2012). The quantitative method and its quantifiable measures gives an objective picture of the competitiveness. Yap (2009) describes factors which determine the competitiveness include measures that are qualitative in nature. For instance those qualitative measures enable an opportunity to fulfil customer requirements, readiness to adapt to change and challenges that occur in the business environment and in the industry (Yap, 2009). To get a wider understanding of the complete competitiveness also qualitative studies have been conducted about subject affecting the

competitiveness such as; container port development, container port competition, container shipping lines and about the supply chain (Notteboom and Yap, 2012). Further, studies where qualitative methods have been used reflects the complexity to measure competitiveness in container ports (Yap, 2009).

1.2 Purpose and problem analysis

The purpose of the master thesis is to investigate how higher competitiveness can be achieved in the arrival and departure process for container vessels within the *Port of Gothenburg* from a quality perspective.

In the arrival and departure process there are many stakeholders present and their roles in the process needed to be investigated, which led to the first research question:

> *RQ1: Who are the stakeholders and what is their role in the arrival and departure process?*

Additionally, an understanding of which activities which occur during the arrival and departure process for container vessels needed to be established for the researchers, hence the second research question was developed:

> *RQ2: Which activities occur during the arrival and departure process of a container vessel?*

Furthermore, literature regarding the areas were studied and summarised in order to develop an objective understanding of the factors which contribute to competitiveness in general and in ports, hence the third question was formulated:

> *RQ3: From a theoretical perspective, how can higher competitiveness be achieved in ports?*

When a clear picture of the arrival and departure process was gained and the stakeholders was identified, potential inefficiencies in the process could be investigated. In order to assure higher competitiveness the solution needed to result in a win-win situation for all or most of the stakeholders. This therefore resulted in the fourth research question:

> *RQ4: What create efficiency and competitiveness in the arrival and departure process from the different stakeholder perspectives?*

One approach to find best practices is to benchmark towards other experiences in different fields in order to generate solutions and ideas for improvements and to increase the competitiveness, hence the following question was established:

> *RQ5: What best practices can be gained from other experiences in the transportation industry?*

1.3 Scope and limitations

With this master thesis the aim is to investigate how the competitiveness for the port community in Gothenburg can be increased. From the definition proposed by Thomas and Martin (2001) there are five organisational groups in a port community; providers of port infrastructure and facilities, providers of cargo handling services, maritime transport operators, inland transport operators and representatives of the cargo (Thomas and Martin, 2001, p. 280). Nevertheless, this thesis focus on the

maritime activities and not the inland activities, therefore inland transport operators and cargo representatives will not be addressed.

Moreover, the focus has been on the port call process i.e. from when a vessel enter the traffic area and to the quay at the container terminal until the vessel leave the traffic area. There are several terminals within the *Port of Gothenburg*, although in this report when writing for instance *the terminal* this refers to the container terminal if nothing else is specified. Aspects outside the port call process have been left out in the report, for instance infrastructure in connection to the terminal will not be investigated. Due to the focus of this research, the only aspects of rail and road transports that will be addressed are the aspects which impact the maritime transports. Related to the scope some consequences occur. First, since the focus is only on the port area activities outside the port boundaries was not considered. For instance there can be bottlenecks in the Swedish infrastructure, which makes it hard to increase the competitiveness through the port call process. Furthermore, since only one of the terminals within the *Port of Gothenburg* is investigated in this thesis, the real complexity in the process is not accounted for. However, this study can be seen as a pilot project and further on all terminals could be investigated.

1.4 Outline

The structure of the report is according to following description; *Chapter one* presents a general introduction, the specific case, purpose and research questions and the scope and limitations. *Chapter two* presents the frame of references for this thesis. The content include theory related to the topic of the report and about applied methods and models. Next, information about the cases with the purpose to benchmark against is presented. In *Chapter three* the methodology for this master thesis is described and motivated. In *Chapter four* the empirical data from interviews and different documents are described. It starts with empirical data about stakeholders, followed by a description of a port call and lastly the challenges and key factors related to the process in focus. In *Chapter five* the analysis is presented. The analysis is based on the empirical data and is related to the models and theories from the frame of references. In *Chapter six* the conclusion with the recommendations regarding how to increase the competitiveness for the *Port of Gothenburg* are presented as well as recommendations for future research.

2 Frame of references

In this chapter the frame of references is presented. First a general section about container shipping followed by a section about competitiveness in ports and lastly Quality management for services.

2.1 Container shipping

This section will start general with a historical perspective of the container shipping industry with the purpose of explaining where it is today and how it got there followed by a section about the challenges of today.

2.1.1 History of the container shipping industry

In 1956 the first container ship, Ideal-X with 58 aluminium truck bodies, first travelled the sea. In the beginning of the container shipping era the capacity and geographical coverage was very limited and the sizes of boxes were incompatible (Levinson, 2008; Griggs, 2013). Shipping companies were resistant to adapt the new technology the development implied since a deployment involved large implementation investments related to ships, terminals and inland transports (Notteboom, 2012). However, much has happened since then and container transport has become a global and highly automated and standardised business (Levinson, 2008) and vessels are now specialised on transportation of standardised units (Notteboom, 2012). Hence, a high utilisation of the ships capacity can be ensured since the standardised containers can be stacked close to each other and on top of each other (Jonsson, 2008). Today the standard boxes are 20 or 40 feet long (Griggs, 2013) and the largest ship can carry a load of 19 224 twenty-foot equivalent unit (TEU) (BBC, 2015). When the container started to become more common for transportation, the cargo became intermodal and the cargo started to move to the ship rather than the opposite (Alderton, 2008). The containers have revolutionised transports and made shipping cheap and changed the world economy completely. Containerisation changed the economic geography since it became almost as easy and cheap to export products to a far off location as it was to sell the products locally (Levinson, 2008). Container shipping has been a substantial and important element for the world trade and the global industrial structure (Peters, 2001) and shipping is today a cost effective solution for transporting cargo over long distances (Griggs, 2013; UNCTAD, 2014). Further, according to Yap (2009) it is certain that demand will continue to grow for containerised transportations on sea for a long time (Yap, 2009). *Figure 3* below is published by UNCTAD (2014) which illustrates the constant increase in seaborne trade.

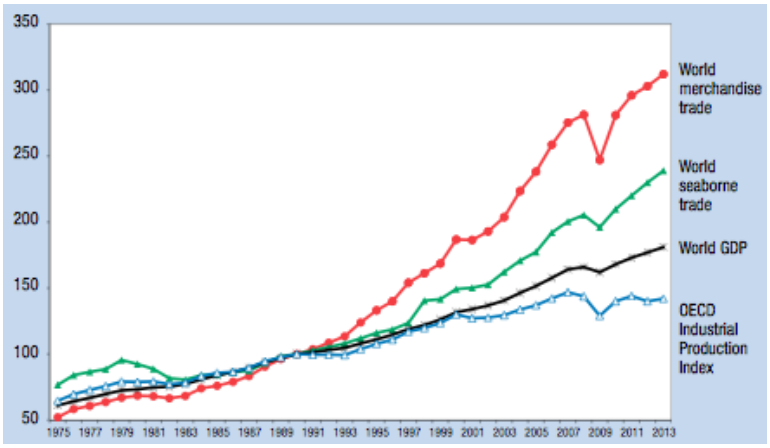

Figure 3: GDP, merchandise trade, seaborne shipments, 1975-2013 (UNCTAD, 2014)

2.1.2 Challenges within the port industry

One effect of containerisation is that the container vessels have grown rapidly which has increased the requirements on terminal capacity and on cargo-handling technology (Alderton, 2008; Griggs, 2013). Furthermore, the pressure on ports has increased in order to maintain rapid turnarounds (Alderton, 2008). The container shipping industry has developed continuously through the history in order to search for profitability. Today immense investments and improvements are required to manage service requirements from the customers efficiently, which is a vital part to stay competitive in the industry (Peters, 2001). In order to cope with the large investments, there is a growing tendency to collaborate between port and shipping companies to develop together (Alderton, 2008). According to Yap (2009) some of the challenges ports faces include; manage the needs of the whole logistic chain, adapt to other stakeholders operating in the container port, using indirect and more creative measures to be able to compete with a wider amount of ports instead of applying traditional incentives based on service and price level. The external environment which surrounds ports around the world creates challenges as well, however a container port has the possibility to take advantage of opportunities and mitigate the influence of the threats (Yap, 2009).

2.2 Competitiveness in ports

In this section competitiveness is first described in general followed by the literature review about the competitive landscape in ports. This will be followed by a case study from the Port of Singapore, efficiency in container shipping and port operations and thereafter a section about supply chain management in ports. Afterwards, supply chain integration in the transportation industry based on best practices from the railway and air transport industry will be presented. Lastly, Stakeholder management will be described.

2.2.1 Competitiveness in general

As stated before, the purpose of this thesis was to investigate how higher competitiveness within the *Port of Gothenburg* can be achieved. It is therefore necessary to explain what is meant by competitiveness in this report. According to the Oxford Dictionary of Economics (2013) competitiveness is defined as; "*The ability to compete in markets for goods or services. This is based on a combination of price and quality. With equal quality and an established reputation, suppliers are competitive only if their prices are as low as those of rivals. A new supplier without an established reputation may need a lower price than rivals to compete. With lower quality than rivals, a firm may not be competitive even with a low price; with the reputation for superior quality, a supplier may be competitive even with a higher price than rivals...".* This definition was chosen since the definition, according to the researchers of this thesis, has a suitable focus for the research topic. Further, since one part of the aim of this thesis was to propose solutions to increase the competitive advantage also competitive advantage is defined; "*An advantage a firm possesses over its competitors. There are numerous sources of competitive advantage, including more efficient production techniques, brand image, consumer loyalty, and location. Possession of a competitive advantage should deliver a firm a higher level of profit than obtained by its competitors*" (Oxford Dictionary of Economics, 2013).

According to Porter (2008) there are five forces which drives the competition in an industry and thereby decides the possibilities for profits (Law, 2009). The framework can also raise awareness and help companies to understand the industry, hence identify how to become more profitable and less vulnerable against competition. If the competitive forces are understood, the industries possibilities to influence and anticipate competition over time can be enhanced. It is not always obvious which force is

the strongest moreover the strongest force or forces will become the most important in the strategy formulation and it also determines the industry's profitability. *Threat of entry* is the first force and refers to the new entrants to the industry which have a desire to gain market shares and bring new capacity to the industry. The barriers to entry determine the advantage incumbents have in relation to the new entrants. Whether the suppliers charging the industry participants different in terms of prices, quality, service and costs is an indicator of *the power of the suppliers*. *The power of buyers* is based on the buyers' possibility to oblige the prices down, demand higher quality etc. The influence or power the buyers have is at the expense of the industry's profitability. In short, the buyers negotiating impact determines the power of the buyer in relation to the industry participants. A *substitute* is defined as something which has similar or the same function as the industry's product. Often substitutes are very different from the current product. Substitutes are always present, but not all substitutes are obvious. Price discounting, service improvements, new product introductions and so on indicates the degree of *rivalry*. A high *rivalry among existing competitors* limits the profitability within the industry. In addition to the forces there are other factors which also must be considered since these factors also influence on the industry. These factors concern areas such as industry growth rate, government, technology and innovation (Porter, 2008). The forces are illustrated in *figure 4* below.

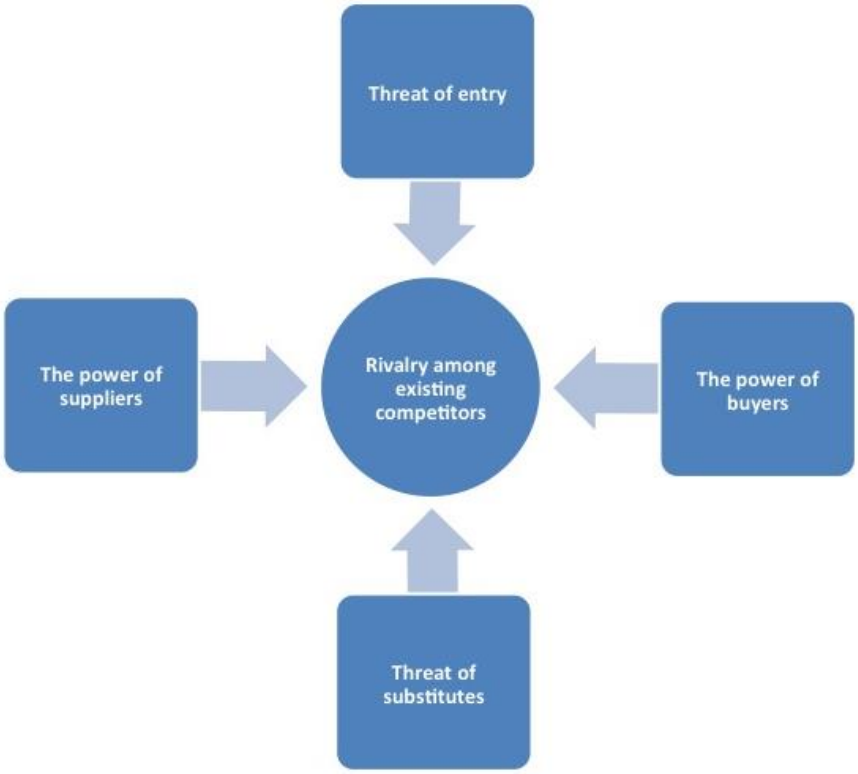

Figure 4: Porter's five forces analysis (Porter, 2008)

2.2.2 The competitive landscape in ports

It is hard to define competitiveness since there are many influencing factors (Notteboom and Yap, 2012). However, a container port's competitiveness is developed and acquired over time by a range of factors which are beneficial for competitiveness (Yap, 2009). Further, as proposed by Winkelman and Notteboom (2007) in Notteboom and Yap (2012), it is even more complicated due to the many industry and community players with different perceptions and interpretations that are involved. This therefore require effective stakeholder relations management. The major focus for competitive strategies today are aimed at terminals (Notteboom and Yap, 2012). The diversity complicates the situation since it is

not the competitive offering offered by the terminal operators, rather it is the total service package or competitive offering a port community with all its entities can deliver which determine a container ports competitiveness (Yap, 2009; Notteboom and Yap, 2012).

The choice of which port to call can depend on several things, for example changes in the intermodal access to hinterland through wider reach or better connectivity (Notteboom and Yap, 2012). According to Alderton (2008) the competition between ports depend on having competitive costs, high service level (i.e. reliable, fast, good communications and low congestion) as well as good connections with road and rail. Yap (2009) and Notteboom and Yap (2012) mentions similar factors which affect the competitiveness of a container port; closeness to key production, consumption or trade lanes, superior hinterland access and connectivity, low port cost for users due to high efficiency, the ability to offer value adding activities to the shipping companies, capacity to expand over time, the possibility to help the users to compete effectively together with other transportation modes, if the port has strong support from key stakeholders within the port and the wider community. Gordon et al. (2005) argues that success most likely occur from a set of factors that interact. An organisation with competitive advantage continuously develop and improve compared to its competitors in terms of quality, time and costs or even as combinations of these (Gordon et al., 2005). The competition in ports is present at several levels. First, competition can take place within one and the same port where different terminal operators compete. Second, competition can take place between terminal operators at regional or national level. Third, competition can also be present between terminal operators at a wider port range. Therefore ports does not only compete with their closest neighbours but within a greater region (Notteboom and Yap, 2012).

2.2.3 A case study from the Port of Singapore

From a case study at the Port of Singapore it has been found that advantage can be achieved by working with terminal operations and information technology. The Port of Singapore has been appointed by Asian freight industry for more than fourteen times to be the best container port in Asia (Gordon et al., 2005). This is also supported by Yap (2009) who identified The Port of Singapore to be the most preferred port by container shipping lines in the Asian region (Yap, 2009).

The Port of Singapore has requirements concerning different areas from their key customers; port charges, freight rates, turnaround time etc. In order to be able to achieve the port´s main objective to be a major transhipment hub, there are enablers that can help sustain the competitive edge and that keep the port operations highly effective (Gordon et al., 2005). The first enabler is that the Port of Singapore has a large merchant fleet. The second enabler is that the Port of Singapore is the largest owner of warehouse space in Singapore and third the workforce in the Port of Singapore is trained to focus on customers and the Port of Singapore has established a quality culture within the organisation. Lastly the port's own operations has been integrated with the customer operations through internet. Furthermore, it is vital to provide value-adding services to the customers to be able to sustain revenues for the Port of Singapore in a long-term perspective. To manage and solve the problems the market growth of container traffic entails, the Port of Singapore has invested in information technology as well as operations technology. Also other initiatives has been done to develop different web-solutions to link the customers to its organisation, this is a strategic action in a long-term perspective since it locks in the customers (Gordon et al., 2005).

The implementation of the different IT-solutions has enabled time reduction, cost savings, increased quality and higher flexibility, which can contribute to sustainable advantage since the technology

provided help for more effective asset utilisation. However, it is important to mention that IT-solutions can not alone create competitive advantage. Rather competitive advantage occur from a combination of resources, which is based on Gordon et al. (2005) opinion that resources is the basis to sustain a competitive advantage, and it is proved that the unique combination of resources it the key to Port of Singapore's competitive edge (Gordon et al., 2005).

2.2.4 Efficiency in container shipping and port operations

As stated in the introduction, Alderton (2008) mention the importance of increasing efficiency in the ports and increasing value-adding activities due to competition (Alderton, 2008). Moreover, efficiency seems to be an important aspect of competitiveness within the container shipping sector (Yap, 2009; Notteboom and Yap, 2012). According to Ducruet and Merk (2013) turnaround times in port is a key indicator of efficiency. There are various ways that could increase time efficiency including; improved vessel queuing systems, updating equipment, using qualified personnel, improved intermodal connections with hinterland, using systems for truck appointments etc (Ducruet and Merk, 2013).

UNCTAD reported in 2014 that ports have impact on the environment in many aspects. First during the initial construction it can affect the wildlife and change the life and health of people living nearby. During the operation the environmental concerns are related to greenhouse gas emissions from engines of equipment such as cranes, also the cargo can create environmental impact for instance some type of cargo like cement and coal can pollute dust. In addition, ships affect though high level of greenhouse gas when burning the fuel. Within ports the port operations is affecting the level of emissions and spill accidents within the ports by the usage of tugs and by providing power during berth (UNCTAD, 2014). According to Eide et al. (2011) emission reduction efforts can be divided in technical options, operational measures, alternative fuels or power sources and structural changes. Technical options could for example be more efficient engines and this category usually involves quite large investments. Operational measures could be slow steaming or improved routines for ballasting etc. Structural changes relates to when two or more counterparts jointly attempts to increase efficiency or reduce emissions, for example by improved logistics and planning. Structural changes can be hard to achieve, however structural changes have high potential. Although, this type of change often require training and change management (Eide et al., 2011).

Further, Johnson and Styhre (2014) investigates the possibilities for reducing time in ports in order to increase efficiency and reduce speed at sea. This means that if a vessel can reduce time in port, for example through increased port efficiency, the vessel has the possibility to increase its energy efficiency by reducing the speed and by slow steaming. This in turn can reduce the CO_2 emissions. However, depending on the market demand shipping companies could also choose to continue in the same speed or even increase speed and instead increase the income by transporting higher volumes of cargo. The vessel speed depends largely on factors such as market demand, price of bunker fuels and on scheduled slots, CO_2 taxes and speed limits (Johnson and Styhre, 2014). Further, Johnson and Styhre (2014) identified some reasons for unproductive time in ports for the shipping companies namely waiting for shipping agent and cargo as well as short opening hours. Also, weather conditions, change of plans regarding routes, and lack of communication among the ship operators, agents and crew can cause unproductive time. There are many actors involved and all the actors can affect the amount of unproductive time in ports. For example if the ship crew is aware of that the employees are unavailable and this is communicated the ship crew can slow steam the ship and thereby save energy and reduce the CO_2 emissions (Johnson and Styhre, 2014).

2.2.5 Supply chain management in ports

The concept of a supply chain can be described as series of processes which are linked together and hence form a chain. In order to add value to the product each member of the supply chain is responsible for a certain value-adding process in the chain (Harrison and van Hoek, 2011). According to Sonat (2006) *Supply chain management* is aimed at achieving effectiveness and operational efficiency. Tongzon et al. (2009) claim that supply chain orientation is necessary within ports and terminals in order to achieve high port competitiveness. Individual firms does not only compete with other individual firms but rather with other supply chains (Robinson, 2002). It is therefore important for ports to incorporate a supply chain focus in their port strategies (Zhang et al., 2013). Increasing customer demands on speed and flexibility, faster switching technologies as well as increased globalisation of suppliers are some of the reasons behind the increased popularity of the concept *Supply chain management* (Mentzer, et al., 2001). Changing markets and customer demands also affect ports (Robinson, 2002). Further, Yap (2009) argues that since container ports aim to compete as focal hubs for containerised goods it is important to think beyond traditional boundaries. Hence, the whole logistic chain needs to be considered and the challenges and issues related to the whole chain need to be dealt with (Yap, 2009). In *Supply chain management* the supply chain is seen as a single entity and it demands for instance system integration and strategic decision-making. Integration in the context of supply chain is related to coordination, for example establishing rules and guidelines for information flows in practice. Improved integration can for instance result in improved performance in the supply chain both upstream and downstream (Harrison and van Hoek, 2011). Bergman and Klefsjö (2010) argue that by expansion of the system view and by integrating the supply chain all concerned actors can be winners (Bergman and Klefsjö, 2010).

Moreover, the global supply chain puts demands on effective ways of coordinating material flows which leads to an increased importance of closer relationships with suppliers (Mentzer et al., 2001). The capability to coordinate the resources can be determined of; the people, facilities and equipment, those are the strongest factors affecting effective resource utilisation (Lee and Whang, 2001; Stefansson, 1998). Tongzon et al. (2009) concludes that in order to achieve supply chain orientation in ports, cooperation between involved parties and mutually acceptable solutions are prerequisites. Supply chain orientation is needed for a higher level of supply chain integration. Moreover, supply chain integration inevitable leads to increased need for a higher level of coordination and cooperation than before. Another critical factor affecting the degree of supply chain integration in ports is the relationship with the port users. For example, having a good relationship with the shipping lines by meeting their expectations can be strategically important in order to make the shipping line continue calling a specific port (Tongzon et al., 2009). Besides, information sharing and mutual trust are needed for supply chain integration. However, information sharing can be hard to realise in practice, due to confidential information or for other reasons some parties are unwilling to share certain information. Increasing the level of trust can increase the level of supply chain integration. Also the quality of information is important, Kanflo (1999) and Ross (1996) suggests that the quality and availability of the information affect the performance of the operations. Another issue regards how to divide costs and benefits from the integration, conflict of interest may arise. Furthermore, it is not always possible to affect the other players in the supply chain and it will therefore not be possible to pursue supply chain integration to a larger extent (Tongzon et al., 2009).

2.2.6 Supply chain integration in the transportation industry

The Canadian railway company Canadian National Railway initiated actions for closer collaboration between actors in their supply chain. The initiative quickly revealed gains, for instance drastic

improvements in the service reliability of goods. Also system reliability improvements occurred dramatically. Additionally, the Canadian National Railway set up an agreement with major port authorities and key port terminal operators in order to improve the flow of goods through the major ports in Canada. The contract provided possibilities for greater structural collaboration between the actors in the supply chain. Through the agreement the Canadian National Railway clarifies what each party is accountable for and what level of service that was required. From the Port's perspective the agreement is vital since 90 % of the goods moving through the port relies on the rail, and it is crucial that the cargo is moved in an efficient and reliable manner from a customer perspective. By the initiative the Canadian National Railway has been able to improve the interfaces with Canadian ports, attain superior transit times and increase the overseas container traffic with 26 %. The CEO Claude Mongeau argues that the agreements are good for all actors involved; *"The bottom line is collaboration. Instinctively, each player in the supply chain tends to focus on its own performance, but with the right organisation, the right metrics and the right mindset, the supply chain works better for all stakeholders and their customers"* (The Globe and Mail, 2010).

Another example regards increasing the efficiency in the air transportation system. For example efficiency could be achieved by focusing on management of the logistic activities and processes related to the airport. According to Norin et al. (2007) it should be an endeavour to increase the efficiency in the transportation system through intelligent resource management, by utilising and processing the available information. Intelligent use does not primarily address technology systems rather focusing on management of the different components in the system, to assure the resources are used in the most intelligent way i.e. to reach the best performance and utilisation of the system. According to Norin et al. (2007) there are challenges to achieve efficiency in the air transportation system. First, there are many different actors in the complex and large system which create challenges to attain overall flow management and efficiency. Further, different actors have different goals and the objectives sometimes contradict. Another challenge is that it is common that delays occur in the system, generally those delays are initiated at the airport. One potential source for the delays can be lack of communication between the actors, and often a delay causes new delays in the chain. One consequence of the delays can be higher en-route speed for the airplanes in order attempt to be on time at the next destination, but the backside and effects of that is increased pollution and higher fuel costs. At the airport most of the stakeholders interact; airlines, passengers, air traffic control, handling companies and the airport etc. In order to maximise the overall efficiency of the system it is important that all stakeholders within the system have access to the same information in order to enable collaborative decision making. The basic requirement is that all actors should be able to influence decisions made by themselves and by other actors that will affect their operations. However, complexity in the decision making process occurs due to the growing amount of information, which puts requirements on the stakeholders to have the ability to manage and utilise the information in order to improve efficiency. The overall objective for the airport logistics (i.e all involved and influenced logistics activities and sub-processes in the air transportation process) is to gain an objective and complete picture of all activities and processes at the airport, hence it is possible to analyse and optimise the operations (Norin et al., 2007).

2.2.7 Stakeholder management

Adapting to other stakeholders is a challenge for the actors within a container port (Yap, 2009) and even more complicated due to the many industry and community players with different perceptions, interpretations that are involved, as proposed by (Winkelman and Notteboom, 2007) in (Notteboom and Yap, 2012). Overcoming these challenges therefore require effective stakeholder relations

management (Notteboom and Yap, 2012). Hence, *stakeholder management* is important to mention in this report and will start with a description about stakeholders in general, followed by some theories related to *stakeholder management* and *stakeholder management* challenges.

Individuals or groups who have some relationship to or stake in an organisation is considered to be stakeholders, for example; shareholders, customers, suppliers, distributors, employees, the media, NGOs, competitors, the public (Friedman and Miles, 2006). One of the most frequently used definition of stakeholders is the definition proposed by Freeman 1984 (2010, p. 32); "*any group or individual who can affect or is affected by the achievement of the organisation objectives*". Freeman's contribution from 1984 is considered to be a seminal text on the stakeholder field (Friedman and Miles, 2006).

Stakeholders with the possibility to directly affect the company are called primary stakeholders. Secondary stakeholders can only indirectly affect the company (Bergman and Klefsjö, 2010). Similarly, Frooman (1999) explains there are two types of stakeholder, the strategic stakeholder and the moral stakeholder. The strategic stakeholder can affect an organisation while the moral stakeholder is affected by the organisation. The first is concerned with managing the stakeholder interests and the latter is about balancing the stakeholder interests (Frooman, 1999). The concept *stakeholder management* is related to "*the necessity for an organisation to manage the relationships with its specific stakeholder groups in an action-oriented way*" (Freeman, 2010, p. 52). From a management perspective, there are many issues which needs to be addressed when it comes to *stakeholder management*, for example; balancing conflicting stakeholder interest, dealing with cultural differences and mediating when strong coalitions exist between groups (Friedman and Miles, 2006). Stakeholders are important participants in development efforts, which has been recognised world-wide (Greiman, 2013). Furthermore, Frooman claim that it can be useful for companies to manage stakeholders if the firm has the ability to do it. Frooman proposed four different strategies to influence stakeholder, the type of strategy is determined on the dependency between the stakeholders and on how strong the dependency is (Frooman, 1999).

Moreover, according to Kanter (1994) successful alliances yield benefits for both parties in the relationship and yield mutual value creation. Managing alliances is not easy and formal structures are not enough, managing the personal and human issues are also critical. Assuming equality and that everyone has something to contribute with to the relationship instead builds trust and respect. If a successful collaboration is to be achieved, the relationship and the differences need active work and integration on many levels. A common language is a benefit and lastly integration on a personal and on a cultural level is crucial in order to be able to create value in the future and to bridge differences, easily resolve conflicts and communicate in a good way. Due to fear of change people and organisations are often afraid of the change the integration implies. Nevertheless, in order to be successful in the partnership the parties must open up for each other (Kanter, 1994).

2.3 Quality management for services

Quality is an important part of competitiveness as can be seen for instance in the definition for competitiveness. This section therefore aims at raising relevant quality and quality management considerations. Further, since the port call process aims at delivering a service this section will discuss quality management from a service perspective. Below the service considerations will be described followed by a more general section about quality management.

2.3.1 Quality for services

Bergman and Klefsjö (2010) defines quality as *"The quality of a product is its ability to satisfy or preferably exceed, the needs and expectations of the customers."* (Bergman and Klefsjö, 2010, p. 23). The quality concept centers around the customer concept and customers are those whom the value creation is aimed at, the customers are the reasons for the organisational existence. Moreover, an organisation can have both internal and external customers. According to Bergman and Klefsjö (2010) an innovative and systematic approach is critical for success with *quality management*. With higher internal and external quality a company has the possibility to gain for instance more satisfied customers, higher efficiency, higher profitability and a stronger market position (Bergman and Klefsjö, 2010).

Goods and services are different and quality improvements have traditionally been focusing on goods, nonetheless the quality methodologies and tools are also applicable for services. There are however some differences between goods and services which need to be considered. First, since services are less tangible it is harder to measure and specify the performance. Further, the customer has a more prominent role in creating services compared to goods and the services are created simultaneously as it is being used. Lastly, services cannot be tested before purchase and services are in most cases created by several sub-services but evaluated based on the complete service package (Bergman and Klefsjö, 2010).

Similarly as products, services consist of thousands of components but in contrast to products services are built up by a combination of skills, processes and materials and not by physical components (Goldstein et al., 2002). Goldstein et al. (2002) explains the importance of the service concept which constitutes of what is supposed to be done and how it is supposed to be conducted in a service context. This is further related to achieving the strategic intent of the company as well as satisfying the targeted customers' needs. Service design is important to consider in order to successfully achieve the service concept. The design model proposed by Goldstein et al. (2002) is illustrated below, see *figure 5*.

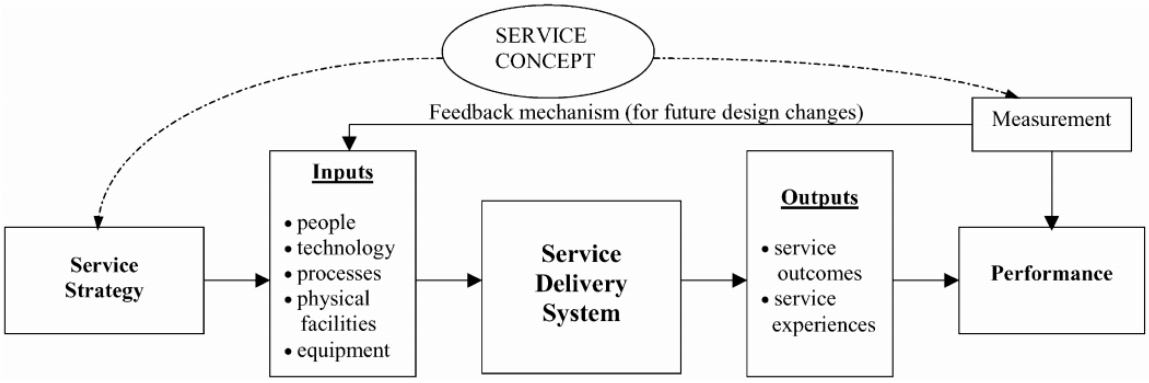

Figure 5: Design model proposed by Goldstein et al. (2002)

The quality of a service can be evaluated from the following eight dimensions; *Reliability*, *Credibility*, *Access*, *Communication*, *Responsiveness*, *Courtesy*, *Empathy* and *Tangibles*. The dimensions define the customers confidence in the service providers. The *reliability* dimension is related to a consistent level of the delivered service, encompassing for instance precision and punctuality and delivering on promises. *Credibility* relates to whether the supplier can be trusted or not. Next, *access* refers to how simple it is to get in contact with the supplier, for example it concern the location of the suppliers, opening hours and possibilities to get in contact with the suppliers through different means of communication. The *communication* dimension is determined by the ability to maintain a natural

communication from the customer perspective. The *responsiveness* is determined by the inclination to help and respond to the customer. The dimension *courtesy* is related to the suppliers' behaviour in terms of friendliness and politeness. The degree of *empathy* is determined by the supplier's ability to comprehend the customers' situation. Lastly, the physical environment where the service is performed and delivered determines the parameter *tangibles* (Bergman & Klefsjö, 2010).

2.3.2 Quality management

Total Quality Management is according to Bergman and Klefsjö (2010) interpreted as "*a constant endeavour to fulfil, and preferably exceed, customer needs and expectations at the lowest cost, by continuous improvement work, to which all involved are committed, focusing on the processes in the organisations*" (Bergman and Klefsjö, 2010, p. 37). The *Total Quality Management* concept is a holistic management system which often is used for incorporating a quality culture. Many believe that quality work is solely about repair and inspection however *quality management* is rather a matter of active prevention, improvement and change. Quality work should be regarded as a continuous process and managed from a holistic perspective. The cornerstones of *Total Quality Management* are; *focus on customers, committed leadership, base decisions on facts, focus on processes, improve continuously, let everybody be committed,* see *figure 6.*

Figure 6: The cornerstones of Total Quality Management (Bergman and Klefsjö, 2010)

Focus on customer is the most central concept within *quality management* and it is about understanding customer needs, wants and expectations and working towards realising these in a systematic manner. To be successful in *quality management* top management´s consistent and continuous commitment to the quality work is required. *Base decision on facts* is about making informed decisions based on reliable data and to be successful on the market it is important to collect, measure and analyse data and information in a systematic and structured way in order to *improve continuously*. *Focus on processes* relates to continuously working with and improving the processes which produces the output of the organisational activities. There are three different types of processes; main processes, support processes and management processes. In order to be successful with *quality management* it is vital to *improve continuously* because if companies stop improving competitors will outrun them. Continuous evaluation of progress and processes, in a fact based manner, is critical. *Let everybody be committed* relates to the commitment and involvement of employees which is important for the success of quality work. Delegating responsibility often enhances the motivation of employees which can increase the

commitment and in turn the results. Lastly, *committed leadership* is vital for creating the right culture and achieving sustainable results. Leaders at all levels need to be involved and engaged in order to create and spread the engagement and create sufficient involvement. Besides the cornerstones it is important to be aware of that the company processes builds up a complete system and the cornerstones are interrelated, hence it is important to have a holistic system perspective in order to understand how various aspect affect each other (Bergman and Klefsjö, 2010).

Moreover, one critical subject in *quality management* is identifying and minimising unproductive time. Toyota with its production system is often seen as a role model when it comes to high efficiency and high quality. According to Liker and Meier (2006) waste elimination, customer focus, continuously improving the ways of working and the processes as well as being a learning organisation are some of the factors behind Toyota's successful culture. Furthermore, waste is the opposite of value adding activities and correspond to everything that does not produce value for the end customer. There are several types of waste for instance waiting, unnecessary movement, defects and unused employee creativity. However, some of the non-value adding activities are needed to enable the value adding activities, these activities should therefore not be eliminated only be kept at a minimal level (Liker and Meier, 2006).

3 Methodology

In this section the methodology for this study will be presented. First the research strategy and design followed by the research process, a description of the data collection, the data analysis, ethics and lastly reliability and validity in qualitative research are discussed.

3.1 Research strategy and design

Due to the nature of the problem and the formulation of the purpose a qualitative research strategy was chosen for this project. Additionally, in order to get a deep and detailed analysis of the problem a case study design was chosen for this project. There are many variants of case studies including single case studies and multiple case studies. Further, within single case studies there are many possible choices of focus including case study over a single organisation, location, person or event (Bryman and Bell, 2011, pp 59-60). In this study a single case study was performed in the port community of Gothenburg. In order to understand the complexity in the process derived from the involvement of many actors the level of analysis was on a holistic organisational level.

Moreover, in business research there are two main ways of approaching theory; deductive and inductive. A deductive approach means that the researcher formulates a hypothesis based on the theoretical field and tests this theory. An inductive approach instead aims to generate theory from practice. However, often deductive research involves elements of inductions as well as inductive research involves elements of deduction (Bryman and Bell, 2011, pp. 11-14). For this study an inductive approach has been used, mainly because the nature of the problem was unclear from the beginning and the researcher therefore tried to understand and identify patterns from in-depth interviews. In addition, at the end of the study deductive elements were used since the results and the identified problems were compared to relevant theory*, see chapter 5 Analysis*. The results were also compared with other experiences from the transportation industry. In order to continue with proposed future research, *see 6.2 Future research,* a possible approach could be to use a deductive approach as well in order to evaluate and try the proposals suggested in this thesis after implementation.

Additionally, when it comes to epistemological considerations in qualitative research interpretivism is commonly used. According to the proponents, interpretivism compared with positivism, is more suitable for qualitative research since understanding humans is very different from understanding natural sciences and natural phenomenon. This implies that different research methods should be used to understand social sciences, including humans, compared to the methods used in natural sciences. Furthermore, the ontological position in this report will be constructionism. This because the study deals with people and organisations. According to the views of constructionism, social actors affect their surroundings. This means for example that if you were to change all members in an organisation at once the culture and the organisation would probably change due to that the new actors are different and hence will interact with each other in a different way (Bryman and Bell, 2011, pp. 15-23).

This study also had characteristics of action research since the purpose of this research was twofold; mainly to provide practical solutions including change and action for real life problems but also to make an academic contribution. According to Bryman and Bell (2011), action research is an approach for researchers together with clients to diagnose and propose a solution for a particular problem. Furthermore, action research is a way to decrease the gap between theory and practice and the role of the researchers in this case was not entirely different from management consultants. Action research is said to be particularly useful when it regards subjects as learning or change within an organisation.

The process of action research involves identification, planning, action and evaluation. The process is not linear but rather an iterative process between the various steps (Bryman and Bell, 2011, pp. 413-414). In this study, due to the time constraint of this master thesis, the main focus was to identify and analyse the problem as well as to propose actions. The aim is that the solutions developed in collaboration between the stakeholders and the researchers should be implemented and evaluated by the organisations within the port and result in real sustainable change. After the study was conducted the researchers had a final presentation with several key stakeholders in the port community where the findings were presented. This presentation served as a feedback mechanism where the results were delivered to the organisations. After the presentation a discussion regarding the findings were held and the researchers got feedback from the stakeholders.

3.2 Research process

To answer the first part of the first research question, "*Who are the stakeholders...",* the researchers had a brainstorming session and used existing mappings of the port call process in order to create a list of stakeholders. The list of stakeholders was then reviewed, adjusted and confirmed by the *Port Authority*. Hence, identifying stakeholders was an iterative process and some stakeholders were not considered before the interviews, for instance the labour union. In order to collect data to be able to answer the second part of the first research question, *"… what are their role in the process?*" and to answer the fourth research question, *"What create efficiency and competitiveness in the arrival and departure process from different stakeholder perspectives?",* interviews were held with different stakeholders. Additionally, in order to enable a comprehensive picture of competitiveness in ports the researchers also studied literature related to the area, thereby answering research question three. During the interviews the respondents were asked to describe the port call process from their perspective in order to enable for the researchers to answer the second research question, *"Which activities occur during the arrival and departure process…."*. Furthermore, the researchers studied already existing mappings of the arrival process before the interviews. Also, data from cases in the transportation industry with the same challenges and problems as those in the *Port of Gothenburg* was studied to enable benchmarking, hence relevant and useful suggestions for improvements could be identified.

3.3 Data collection

Prior to the start of the research, a literature review was initiated. According to Bryman and Bell (2011) this is beneficial for many reasons. For example, it can prevent the researcher from making the same mistakes which have already been made and avoiding reinventing the wheel and it can also be helpful when interpreting the findings (Bryman and Bell, 2011, p. 103). The literature review has continued in parallel of the more practical part. This because the problem area was specified from the beginning but the reason behind the problems was not known. In the beginning the researchers read about the shipping industry in general and about improvement efforts within the port and shipping industry. The researchers used search words related to the topic as for example *competitiveness, efficiency, competitiveness or efficiency in shipping, container transport, stakeholder management, quality management and supply chain management.* Mostly internet based databases at the university library home page as well as Google scholar were used. However, the researchers have also visited physical libraries in order to search in books, magazines and published reports within the research area. After relevant literature was found the researchers looked further to the references in order to find other interesting aspects. Both primary data and secondary data have been used in the research.

One way of collecting data is through documents. Documents can mean many different things including personal documents, public documents, official documents (for example annual reports, policy documents) and mass media output (Bryman and Bell, 2011, pp. 544-564). In this study documents have been an important source of data, especially documents from different company homepages. According to Bryman and Bell (2011) internal and external company documents are a good way of building a description of the company studied. This was mostly done in order to prepare before the interviews with the different stakeholders. Information regarding different stakeholders was read in advance, hence a greater understanding was created and instead the researchers could focus on asking more specific question related to the purpose of this thesis during the interviews.

According to Bryman and Bell (2011) interviews is the most applied method in qualitative research. The underlying reason for the attractiveness is the flexibility in interviewing. The drawback of the method is that interviewing and analysing the results is time consuming. There are two major types of interview approaches when using the qualitative interviewing method; unstructured and semi-structured. The characteristics of an unstructured interview is very similar to a conversation and the researcher prompts to deal with certain topics. The semi-structured interview is on the contrary based on that researchers formulate a list of questions which covers specific topics, the list is also referred to as interview guide. The interview questions does not have to follow the outlined schedule exactly. Hence, both unstructured interviews and semi-structured interviews provide a flexible interview process (Bryman and Bell, 2011, pp. 465-498).

Therefore, in this research the semi-structured approach was applied since it was identified as the most suitable approach to collect data from the stakeholders about the arrival and departure process but also to understand the arrival and departure process from the different stakeholders´ perspective. Additionally, semi-structured interviews was chosen before unstructured interviews since some degree of structure would make the result from interviews from different respondents comparable and easier to analyse. The respondents for the interviews were selected based on snowball sampling i.e. initially the researchers made contact with a few stakeholders by telephone, which were relevant for the purpose of the topic for the interview. Based on the first interviews the researchers made contact with other stakeholders. This approach was mainly used since the researchers did not know which of the stakeholder which were most suitable for the purpose. For the interviews the researchers used a prepared interview guide, *see Appendix A*. The empirical data was collected from seventeen interviews, including two telephone interviews. The respondents represented the following groups; *Port Authority, pilots, pilot ordering function, Vessel Traffic Service, linesmen, towage, shipping companies, vessel crew, the terminal and shipping agents.* Additionally, some information was gathered during more informal meetings. The gathered data from the interviews was mostly perception data. Most of the interview material was recorded and transcribed in order to support the researchers memories and allow for a more thoroughly examination the respondents answers. However, according to Bryman and Bell (2010) transcribing is very time-consuming, which is considered a drawback with the method. After transcribing the interviews were summarised and the two researchers coded each transcript individually. Subsequently, the coded documents were compared and patterns were identified. The analysis of the material from the research was performed continuously during the project to enable identification of themes or patterns in the result to enable possibilities to ask about new discoveries in later interviews. The researcher evaluated the interview guide after gaining experiences from the interviews and thereafter slightly reformulated some of the questions in the interview guide.

During the project the researchers had the possibility to attend workshops where stakeholders were gathered to discuss issues related to implementation of an ICT related platform. During the workshops vital issues related to the challenges covered by this thesis topic were brought up although the ICT initiative had another focus than this research. The workshops were held at several regular occasions and took two hours. Not all of the topics brought up were relevant for the purpose of this thesis and therefore the workshops were not recorded and transcribed. Instead the researchers made detailed notes and summarised the notes in direct connection to the workshop.

3.4 Data analysis

In order to understand the competitive situation in the port industry the Porter's five forces model was used as a basis to analyse the competitive situation for the *Port of Gothenburg*. The framework was used in order to understand the current competitive situation for the *Port of Gothenburg*. The main takeaways from the five competitive forces intended to direct the analysis of how to increase the competitiveness in the port in the most appropriate and strategic way. The framework was used as a complement to add another dimension to the findings from the literature review regarding what creates competitiveness and what affect the choice of port. The analysis was complemented with other relevant theoretical principles such as the cornerstones of *Total Quality Management* as well as concepts for service quality. This in order to illustrate how the service package delivered by the port community of Gothenburg is perceived by the customer. Case studies from the *Supply chain management* field were also used as a source of inspiration in order to see how similar problems experienced in the *Port of Gothenburg* have been tackled elsewhere. Additionally, *stakeholder management* has been used to understand and address the complexity created by the many actors involved in the port call process. Lastly, in the discussion the main challenges identified in the analysis were discussed as well as the suggestions to improve and manage the challenges. Subsequently, areas for further research were identified.

3.5 Ethics

As a researcher it is important to consider and to have a strategy for assuring that the research is conducted in an ethical way. There are several quite similar principles and in this report the ones created by Diener and Crandall (1978) presented in Bryman and Bell (2011), are used. Here the ethical principles are divided into four areas; harm to participants, lack of informed consent, invasion of privacy and deception. Harm to participants can for example be physical harm, harm to their possibility for development or harm on their self-esteem or stress. It is the responsibility of the researchers not to harm participants or others that might be affected negatively by the research. Lack of informed consent concerns the information the participants are provided with regarding the role and the intentions of the researcher. Invasion of privacy relates to ensuring that participants do not feel pressured to share too personal or sensitive information. Deception means that the researchers lies about the reasons, methods or usage of the research and the participants therefore gets a false picture of their role or contribution (Bryman and Bell, 2011, pp. 128-138). In order to assure this master thesis was conducted in an ethical way and that participants were not harmed in any way the participants were informed in advance and the intentions of the thesis as well as the intentions of the interviews were clarified. Also the respondents were informed that it was okay to interrupt and ask questions if anything was unclear and the respondents had the possibility to refuse to answer the questions. In order to prevent individual opinions and perceptions to be distinguished the data collected from the interviews have been handled

anonymously and no names are presented in the report. This ethical consideration was especially vital since many of the actors know each other quite well.

3.6 Reliability and validity in qualitative research

In order to assess the quality of research the concepts reliability and validity are commonly used. However, these concepts are developed mainly for quantitative research. In contrast, the concept of trustworthiness is developed for assessing the quality of qualitative research. Trustworthiness consists of four criteria; credibility, transferability, dependability and conformability. Additionally, also authenticity is used to assess the quality of qualitative research (Bryman and Bell, 2011, pp. 394-401). Since quality related issues always are relevant and improvements for organisations to increase the competitiveness are continuous endeavours, the method and result from this thesis is transferable both to other context and the same context in the future. The thesis conformability is strengthened since the researchers constantly pursued for objectivity and aimed at identifying improvement proposals, which are beneficial for all involved stakeholders. The importance and urgency of the issues this thesis covers were confirmed from many respondents and at the workshops and the researchers also participated at the Swedish Maritime Day with stakeholder from the Swedish maritime sector. Also the findings were confirmed by the stakeholders, which participated in the study. Bryman and Bell (2011) suggests a combination of methods in research, *triangulation*, in order to get a reliable and valid understanding of the research, especially in complex settings. Therefore secondary data from case studies, articles and newspaper articles etc. have been used in order to validate and triangulate the primary data collected from the interviews. Many aspects mentioned in the interviews were confirmed by secondary data from other references. The combination of interview data and documentation gave a balanced and comprehensive view and the combination of mappings and other documentation complemented and validated the interviews.

Furthermore, the models and theories used in this case study can be criticised. First, Porter's five forces framework is mostly used when analysing if it is attractive or not to enter an industry and has mainly been used in the context of one single organisation and not in the context of several interacting organisation which this thesis addresses. Hence, the framework is not totally applicable since it does not fully address the complexity but it will give an indication of the characteristics of the competitive environment in the port community and we believe that the model is applicable in the way it has been used in this thesis.

In order to increase the competitiveness the *Total Quality Management* concept is suitable, it is a strategic approach for the port and quality concepts have been proven successful in other industries like manufacturing. The applicability of quality concepts can be questioned since the concepts are not as proved in the context of services. However, the quality principles are claimed to be as useful in the context of services. Moreover, increased quality and decreased costs have been the results from applying *Total Quality Management* therefore it can be useful for the *Port of Gothenburg* as well in order to meet the challenges the port industry faces. *Supply chain management* has been considered since it contains relevant issues, which are useful in the port context and can increase the competitiveness. In the literature studied for this project supply chain orientation, supply chain focus and *Supply chain management* are described somewhat different, but in the context of this report the holistic view and cooperation are the vital parts to learn from and the specific wording is therefore not important. After the literature study the researchers' perceptions were that not much has been written about *Supply chain management* in a port or a service context. Still the practical implications are useful in the port

setting and have therefore been considered. Furthermore, when it comes to the challenges and context of the cases presented in the frame of references the researchers believe that these experiences are applicable. The condition for each case differs from the *Port of Gothenburg* for example the Port of Singapore is much larger than the *Port of Gothenburg* and has more resources, but still the principles have been considered as highly applicable.

4 Empirical findings

In the following chapter the empirical findings are presented. First the actors will be described, then the port call process and lastly the key factors and challenges. The empirical findings are collected from documents, the conducted interviews as well as from participation in workshops and discussions. If no other references are stated the information has been provided from interviews or other oral sources. The information gathered from documents or from company webpages is clearly referred to. Most of the data presented in this chapter has been collected through interviews with stakeholders. In order to assure the respondents integrity names and sensitive information has been left out.

4.1 The actors in the port community of Gothenburg

In the following section the actors within the port community of Gothenburg will be presented after a short general introduction.

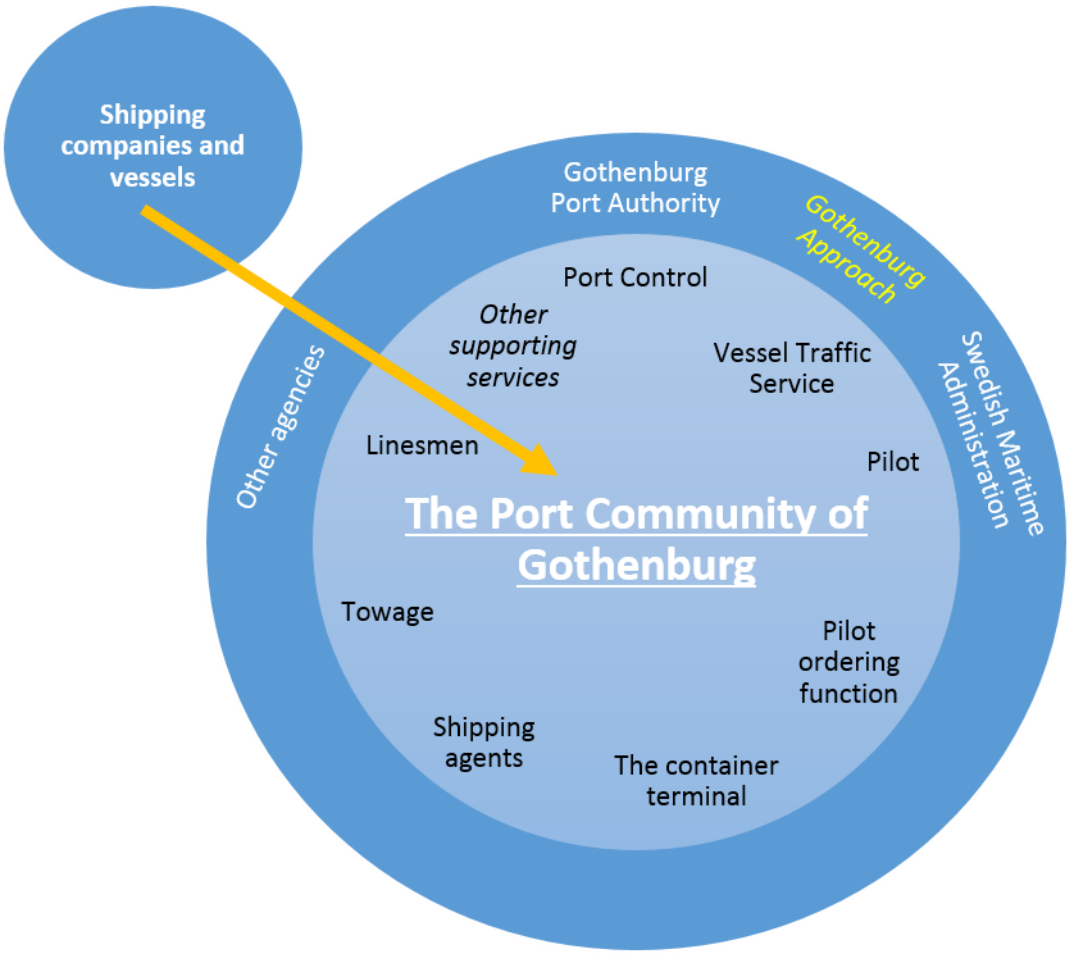

Figure 7: The actors in the port community of Gothenburg

Figure 7 above illustrates the actors within the Port community of Gothenburg within the scope of this thesis. The actors in the inner circle are directly involved in the arrival and departure process while the actors in the outer circle are only indirectly involved in delivering the service to the shipping companies and vessels.

In this report, the term *Port of Gothenburg* refers to the whole port, the physical place and the infrastructure. Many different highly specialised actors are involved when a container vessel arrives or departs to or from the *Port of Gothenburg* and cooperation and communication between actors are

therefore of great importance in order to assure an effective process (Göteborgs Hamn, 2014c). The actors have varying structures and goals in their organisations. For instance, some actors are municipally, there are several Swedish authorities while others are privately owned profit-driven businesses. Further, some actors are local while others are either national or even international players. Below, the actors within the *Port of Gothenburg* as well as their role in the arrival and departure process is shortly described. Actors not directly involved in the process will only be presented shortly. First the actors within the port community are described and lastly the shipping companies. The description is solely based on the actors' roles in the port call process for container vessels.

4.1.1 Gothenburg Port Authority

The publicly owned Port Authority in the *Port of Gothenburg* owns the land and infrastructure in the port area. However, the responsibility for the operation of the container, car and roro terminals is transferred to external operators). Similarly as other port structures around the world, the City of Gothenburg is the owner of the *Gothenburg Port Authority*. The City of Gothenburg therefore formulates the goals and the orientation for the Port Authority (Göteborgs Hamn, 2014a).

4.1.1.1 Port Control

Port control is a function within the *Gothenburg Port Authority* (Göteborgs Hamn, 2014), which is responsible for managing the utilisation of the resources within the port. *Port control* is also responsible for coordinating the port call in collaboration with all terminals in the *Port of Gothenburg*. For instance in the case of the container terminal, the coordination involves operational communication e.g. placement of the cranes at the quay and time updates. When a vessel arrives to Gothenburg the Port Authority provides certain functions. *Port Control* is the traffic coordination and authorisation centre, all vessels which intends to call the *Port of Gothenburg* must send a vessel notification in advance to *Port Control,* according to laws and general port regulations. When the vessels need service, as for example sludge handling or fresh water supplies, it is ordered from *Port Control* in advance (Göteborgs Hamn, 2014). *Port Control* are also issuing authorisations of e.g. diving work and other maintenance work. Further, surveillance of the port general regulations is carried out by *Port control* and handling of matters involving the sea traffic in *Port of Gothenburg*'s traffic area such as events.

4.1.2 Swedish Maritime Administration

The *Swedish Maritime Administration* is a governmental agency, which direct safe, available and effective sea routes. The shipowners and captains are the primary customer. The shipping agent often orders services from *Swedish Maritime Administration* on behalf of the ship captain and ship owners (Sjöfartsverket, 2013). The *Swedish Maritime Administration* provides the functions *Vessel Traffic Service*, pilotage and pilotage ordering function.

4.1.2.1 Vessel Traffic Service

Vessel Traffic Service monitors and communicates with vessels that are navigating in the concerned areas in order to ensure secure passage to and from the *Port of Gothenburg* (Sjöfartsverket, 2013). The *Vessel Traffic Service* function operates in order to maintain and follow the regulations provided by the *Swedish Transport Administration*. The *Vessel Traffic Service* function is in charge of a specified geographical area; the limit is about six nautical miles outside of Gothenburg. Within this area all vessels are obliged to report their presence. The primary duty for the *Vessel Traffic Service* is to provide accurate traffic information to support the captain. For example, the information can concern traffic or special circumstances in the fairway.

4.1.2.2 Pilot

In Sweden pilotage is mandatory for certain parts of fairways in order to ensure high safety and the size of the vessels and type of cargo determining the necessity for pilotage (Sjöfartsverket, 2013; Transportstyrelsen, 2012). *Swedish Maritime Administration* provides the pilotage services in Swedish waters. The pilot area in Gothenburg, range from south of Marstrand to Kungsbacka, and into Frihamnen (Göteborgs Hamn, 2014c). On the nautical chart, see *Appendix B*, the pilotage lines are marked, within those lines pilotage is obligated. There are some container vessels that have pilot exemption, but in most cases pilotage is obligated. The pilots have their own boatmen, who are responsible for transporting the pilots to the vessels in a safe manner (Sjöfartsverket, 2012). The pilots role is to be an advisor on board for the captain, in order to enable a safe port call and to do risk assessments. There is continuously contact between the pilots and *Port Control* about the conditions that needs to be considered during the pilotage for example diving operations (Göteborgs Hamn, 2014c).

4.1.2.3 Pilot ordering function

The *pilot ordering function* mission is to divide the work between the pilots. Five hours before Estimated Time for Arrival (ETA) the shipping agent, alternatively the shipping company, contacts the *pilot ordering function* in order to reserve pilotage time for the arrival. The time can be changed one time, however no later than three hours in advance. Additional changes, or changes closer than three hours before the original time causes a fee. The ordering process is identical for departures. The time regulations for ordering pilotage are the same everywhere in Sweden and are decided by *Swedish Maritime Administration.*

4.1.3 Gothenburg Approach

In order to make the arrival process more efficient the *Gothenburg Port Authority* together with the *Swedish Maritime Administration* have started an initiative called *Gothenburg Approach*. Through this initiative *Port Control*, *Vessel Traffic Service* and the *pilot ordering function* have been co-located in order to improve the efficiency and reduce the environmental impact through faster and easier information sharing (Göteborgs Hamn, 2014a). The *Vessel Traffic Service* and *pilot ordering function* will be described in the sections below.

4.1.4 The container terminal

APM Terminals is the operator of the container terminal, after signing a concession agreement with the *Gothenburg Port Authority* in 2012 (Göteborgs Hamn, 2014b). APM Terminals is a global terminal operator which operates in more than 160 ports in 58 countries (APM Terminals, 2015b). The container port in Gothenburg is the largest container terminal in the Scandinavian countries and the only terminal in Sweden with the capacity to receive the largest container ships (APM Terminals, 2015a). Further, the terminal has the capacity to handle one deep sea ship at the time, depending on the draught. Approximately 20 container vessels arrive at the port every week which means that more than 50 percent of the containers to and from Sweden pass Gothenburg (Göteborgs Hamn, 2014b; APM Terminals, 2015a). At the container terminal containers are handled for three different modes of transportation; rail, road and sea transports (Göteborgs Hamn, 2014b). From the *Port of Gothenburg* 25 commuter trains connect the port with inland terminals in Sweden and Norway. Every day 70 trains arrive and depart from the *Port of Gothenburg* to the largest cities in Sweden and Norway (Göteborgs Hamn, 2014a).

The container terminal in Gothenburg provides container related services such as loading, unloading, storing and moving containers between different modes of transportation. In addition to the actual execution and handling of containers the terminals also have a planning function. For example planning of berth position, which is coordinated with *Port Control*. This information is later communicated to agents and other actor as well as information about when the loading operations are supposed to be finished and vessels are ready to depart. Before arrival, the shipping companies provide the terminal with so called pre arrival information about volume, quantities of import and export and a request for departure. Based on this the terminal planning function estimates possibilities to fulfil the request and either confirms the request or proposes adjustments. Agents are informed if involved in that particular port call. Based on the information from the shipping company regarding the cargo the terminal operators also plan, coordinate and move cranes and containers into the right position.

4.1.5 Shipping agents

The shipping agent represent the shipping company and the captain when arriving to the port (Göteborgs Hamn, 2014c), however some shipping companies manage the agent's functions on their own. The shipping agent´s customers are the shipping lines and the owner of the goods (Sveriges Skeppsmäklarförening, 2015). The agent gets pre-arrival information from the captain, which is required to enter Swedish water. In connection to this information the agent determines if there is a need for special assistance. The shipping agent finances port calls, communicates berth position, orders pilotage and towage, and assists when problems occur. The agent coordinates with the terminal to confirm that the terminal has enough staff and cranes to manage the containers. The agent boards the ship after arrival and before departure to communicate with the captain. The agent orders the departure on the terminals commission. The aim for the agent is to assure that the vessel arrives and departs at the right time to avoid unnecessary unproductive time.

4.1.6 Towage

The international towage company Svitzer is the tugboat operator in Gothenburg. Tug boats are used when vessels cannot maneuver themselves, for example since the vessels are too large to maneuver in the narrow and highly trafficated areas in the fairway or by the quay. Further, tugs are used in order to increase the safety. During the towage operation the tugboat captain is in contact with the pilot onboard at the towed ship, via VHF-radio. For some of the terminals within the *Port of Gothenburg* there are regulations concerning the number of tugboats that should be used during normal conditions (Göteborgs Hamn, 2014d). However, at the container terminal there are higher arbitrariness regarding the usage of tugs. There are no regulations and even some of the largest ships can approach the quay and moor the vessel without tugs.

The towage operator in Gothenburg have a geographic coverage which includes the *Port of Gothenburg*, Stenungsund and Wallhamn. Sometimes these tugboats are also used for other assignments, for example in Denmark. It is therefore important for the towage company to receive information in time in order to assure availability and to plan the resources. Concerning towage operations to or from the container terminal the agent usually delivers preliminary information one or two days in advance. Due to increased market awareness of environmental issues the towage company has initiated a pilot project and developed ECO tugs and two of these tugs are currently in use in Gothenburg. These ECO tugs have less impact on the environment during operations.

4.1.7 Linesmen

Klippan Båtmansstation is providing services to vessels in the area of Gothenburg and has linesmen berthing and unberthing vessels (Klippan Båtmansstation, 2015). Vessels with a length below 80 meter do not need support by linesmen although all container vessels are longer than 80 meters. The linesmen are contacted and assigned work sometime between five hours before until half an hour before the ship needs linesmen support. The *Vessel Traffic Service* function contacts the linesmen planning function when the ship has passed the reporting point in the entrance to Gothenburg. When the vessel arrives, the linesmen are prepared at the quayside and indicate the position for the berth and it is important that the position is accurate. When the vessel is approaching the quay, the vessel crew throw the lines to the linesmen and then the linesmen bowse the hawsers. The linesmen are also present during the departure. During the operations it is a continual contact between linesmen, captain and the pilot on board at the ship on VHF-radio.

4.1.8 Supporting services in the port

Besides the actors and functions described above, many more can be involved. For example, bunker service, fresh water supplies, sludge handling, security monitoring companies and SMHI. These actors are not involved to a great extent in the actual arrival and departure of the vessels. Moreover, maintenance work at the port's facilities and diving operations indirectly affect the arrival and departure process and therefore the disturbances need to be considered. There are also some other government agencies which are more or less involved in the port operations or the sea traffic. The *Swedish coast guard* is responsible for surveillance and rescue at sea as well as communicating relevant maritime information to other agencies as well as handling potential emergencies (Kustbevakningen, 2012). The *Swedish Transport Administration* is responsible for the long term planning of the transportation system in Sweden, including road, rail, sea and air transports. The *Swedish Transport Administration* is also responsible for building, and maintenance of the publicly owned roads and railways (Trafikverket, 2015). The *Swedish Transport Agency*, and specifically the *Maritime Department of the Swedish Transport Agency*, investigates for example accidents at sea and monitors whether environmental rules and regulations are followed (Transportstyrelsen, 2015). The *Swedish Customs* is responsible for managing the goods flow in and out of Sweden as well as simplifying legal trade and preventing illegal trade (Tullverket, 2015). The actors within the *Port of Gothenburg* reports to several of these governmental agencies.

4.1.9 Shipping companies

The container vessel traffic can be categorised in two types, direct traffic and feeder traffic. Both types are calling the *Port of Gothenburg*. Direct traffic implies minimisation of transshipments. Most of the vessels calling the container terminal are line traffic and have approximately the same schedule every cycle. Feeder traffic can be described as a bus service, where the customer makes a reservation for their cargo. Furthermore, usually cargo is shipped to a central port in Europe by direct traffic and then transhipped by feeder vessels to smaller ports in Europe. Some of the shipping companies have vessels for only containers while others have vessels for wheeled cargo, called roll on roll off (Ro-Ro). There are also some vessels that have a combination of both containers and wheeled cargo, called Con-Ro. When Con-Ro vessels are calling the *Port of Gothenburg* the terminal operator for Ro-Ro, Logent is involved in loading and unloading at the container terminal. Some of the shipping companies have exemption to call the port without pilotage and towage, if the captain has gone through a special training and is assigned permission. As mentioned in previous sections, not all shipping companies use agents, hence the shipping companies' responsibility differs.

4.2 The port call process of Gothenburg

In the following section an example of the port call process from an external perspective is described.

The example is a description of an ordinary port call, although the process varies depending on the circumstances and all port calls are somewhat different. In the description of the process it will be referred to some geographical areas, see the nautical chart in *Appendix B*. The process described below is the short term planning and most stakeholders involved are aware earlier when the vessels are estimated to arrive in order to plan resources etc. How early different stakeholders needs information depends on several factors, such as flexibility, service level and the geographic coverage.

No later than 24 hours before the arrival the vessel is obligated to register the vessel to *Swedish Maritime Administration* and the *Gothenburg Port Authority*. This is either done by the shipping agent or the shipping company, requests regarding for instance sludge and fresh water are reported simultaneously. *Port Control* approve the registration and the approval is done in collaboration between *Port Control* and the terminal's planning function. Berth conditions, draught, time schedule, cargo planning etc. are considered and the vessel is thereafter assigned a berth position. Five hours before ETA pilotage for the arrival is reserved. If needed the ETA is revised later on. In connection to the pilotage reservation also towage service is confirmed. The pilot ordering function plan which vessel the pilot will serve about one hour before the vessel is approaching.

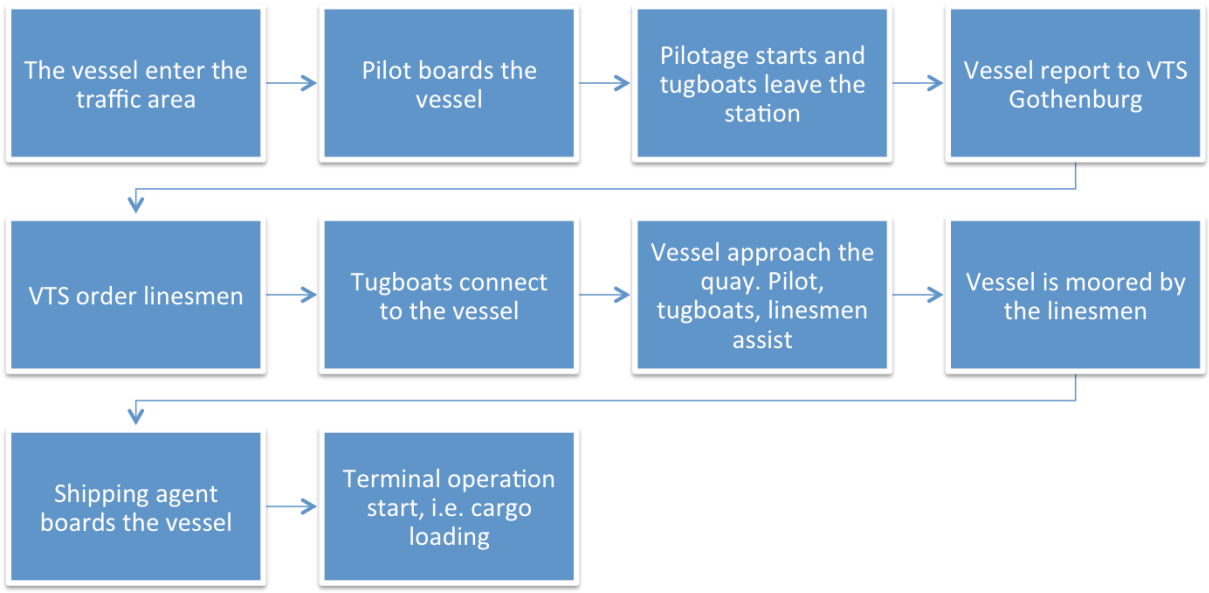

Figure 8: An example of the arrival process in Gothenburg

The arrival process is illustrated above, see *figure 8*. When the vessel enters the traffic area the captain report entering to *Vessel Traffic Service*. Later on when the vessel approaches Gothenburg it decreases the speed to around 8-9 knots and the pilot boards the vessel. There are a four different boarding points for the pilots in the fairway, usually close to Trubaduren or west of Vinga. The pilot climbs on board using a traditional rope-ladder and then the pilotage operation starts. The pilot does not take over the command but guides and assists the captain. In the fairway towards Gothenburg there are certain reporting points depending on the route, see point three and four on the nautical chart in *Appendix B.* At these points the captain contact the *Vessel Traffic Service* Gothenburg on VHF-radio. Further, during the contact with *Vessel Traffic Service* the berth position is confirmed and the *Vessel Traffic Service function* orders linesmen.

The tugboats leave the tugboat-station approximately at the same time as the pilot boards the ship in order to meet and physically connect with the vessel at Rivö Fjord, see point five at the nautical chart in *Appendix B.* The need for towage service depends on the conditions of the vessel, the weather situation and if the vessel needs to be rotated. When the vessel approach the quay the pilot and captain with help from the tugboats bring the vessel into the right position at the quay. The position for the vessel is planned by the terminal and *Port Control* based on the vessel's draught and length. Since the cranes are prepared and placed in the correct position and the containers are prepared in advance, it is important to get the vessel in the right position. At the terminal quayside the linesmen are waiting to start mooring the vessel into the right position with the hawsers. In a normal situation when a vessel will be moored there are four linesmen involved, the linesmen use a boat on the seaside but also cars with winches on the land side. When the vessel is moored, the job for the tugboats, the linesmen and the pilot is completed. When the pilot leaves, the shipping agent boards the vessel and the terminal operations start. At the terminal the containers are loaded and unloaded as well as moved between different modes of transportation. The vessel has a time window to follow, i.e. the scheduled time in port, when the time has passed the terminal operations should be completed and the vessel ready for departure.

The departure procedure is similar to the arrival. Pilotage and towage are pre-ordered five hour in advance for the departure, linesmen are later on also informed. Five minutes before departure the captain contacts *Vessel Traffic Service* for clearance. Next, the linesmen unberth the vessel, while the tugboats assist the unberthing operations and the pilot assists the captain to get the vessel out to the fairway. After passing the pilotage line, the pilot´s boatmen pick up the pilot in one of the zones with boarding points outside Gothenburg and the container vessel can continue its route to subsequent destinations.

4.2.1 The communication during the arrivals and departures

During the interviews the researchers asked the respondents about with who and how the communication between actors usually worked during the arrival and departure process. The figure below illustrates an example of the communication five hours before departure until right before the departure is supposed to start. The illustration is based on information received during interviews. If any circumstances change or anything extra is needed the communication will be more extensive compared to the communication in *figure 9* below.

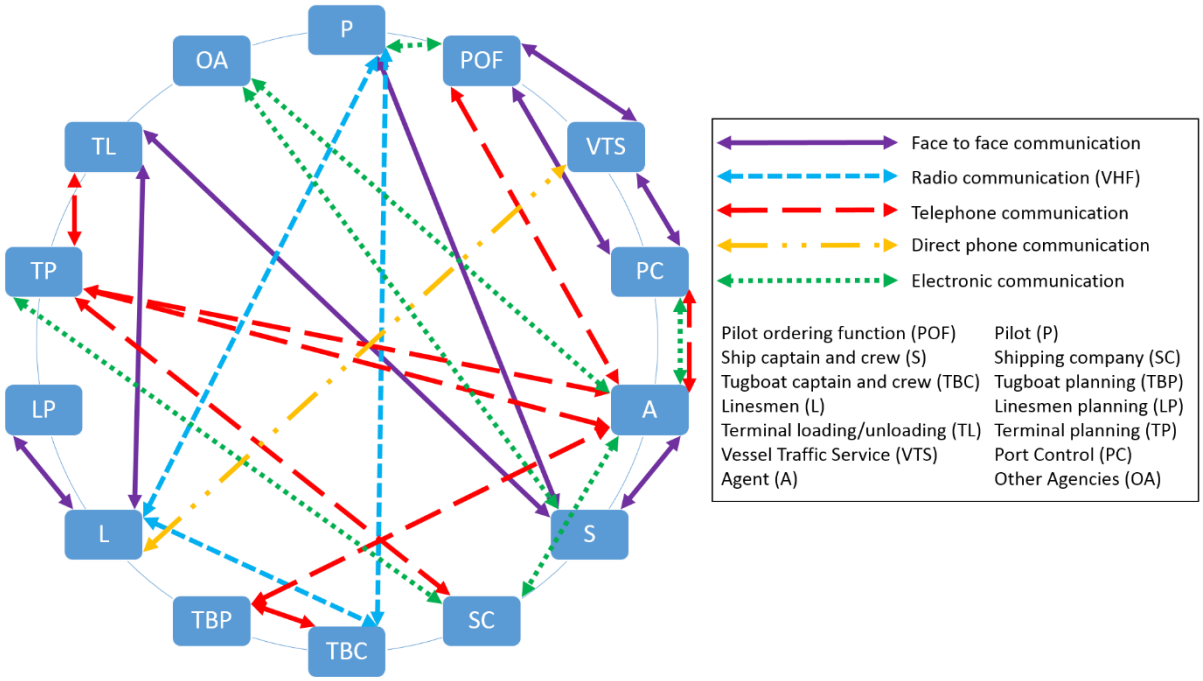

Figure 9: Communication five hours before departure until right before departure

For examples of the communication 24 hours before arrival, during arrival and during departure, see *Appendix C and D*. The communication will be further analysed in *section 5.2.3 Enhancing the quality of communication and information*.

4.3 Challenges and opportunities

In this section key factors related to a port call is described thereafter the competitive situation and challenges are presented. Lastly the terminal and its challenges are described followed by other challenging factors.

4.3.1 Key factors

During the interviews some key factors and prerequisites for smooth and efficient arrivals and departures were brought up. Correct and reliable information were factors mentioned by almost all respondents. Having all important information available facilitates the operational work as well as the planning of resources. Good communication and foresight were also mentioned as vital. When something change it is important that the information about the change is communicated immediately, which creates possibilities to manage the situation in the best manner. Furthermore, communication is important to coordinate different resources. It is not an option to compromise safety hence safety is a critical factor. Additionally, high availability for quay meters and flexibility at the terminal are factors shipping companies demand, since it sometimes occur situations when the shipping companies miss to accommodate their time slot. Also high efficiency at the terminal is something shipping companies request. On the contrary, the terminal consider vessel punctuality as a key factor since delays created large difficulties regarding flow and staff planning. Neither the terminal nor other actors prefer unexpected occurrences, for instance misplaced containers compared to specified information. Also collaboration was raised as a key factor for effective and smooth arrivals and departures. The collaboration between actors are important since there are many parts in the arrival and departure process that have to be synchronised. When shortcomings occur somewhere in the process risks for domino effects are created. Lastly linesmen, pilots and tugboats have high service degree which can be seen as a key factor.

4.3.2 Competitiveness

Gothenburg has a strategic location which is one of the reasons why lots of shipping companies transport their cargo via Gothenburg. The port is easily accessible and there are good railway connections. The *Port of Gothenburg* is the largest port in Scandinavia, though compared to other ports in Europe it is relatively small.

Within a short future one respondent predict that the terminal will have the best cranes in use due to the investments. However before a satisfactory level of efficiency can be reached a period of training and implementation of new working routines are needed. Hopefully, this will lead increased efficiency at the terminal. Hence shipping companies will be able to bring a larger amount of containers and thereby decrease the number of port calls for instance from two to one port calls a week to Gothenburg and consequently decrease their expenses.

According to many respondents the *Port of Gothenburg* is an expensive port to call. Also the handling is expensive compared to other European ports, while other interviewed respondents believe that the rates are aligned with the Scandinavian pricing. For example labour costs are considerably higher in Scandinavia compared to other parts in the world, on the other hand compared to other Swedish ports Gothenburg is the most expensive. One representative from a shipping company argues that Gothenburg is the second most expensive port on their routes. Which leads to a focus on port calls to Gothenburg for the concerned shipping company since it is expensive, the service level is not good enough and it is lack of quay meters. The prices at the terminal have increased every year for a period of time, therefore one respondent argues it is important that the terminal has a sufficient and satisfactory service level to stay competitive.

Shipping companies are using larger vessels i.e. the vessels get deeper draught and the competition for the heavily trafficked quay for deep sea vessels have increased. Therefore there is a demand for increasing the availability to the quay through dredging the seabed, hence the quay meters for deep sea vessels could be increased. Through this action two deep sea vessels could be handled simultaneously. This is, according to one respondent, vital if the port wish to continue with increased number of routes to and from Asia since the large vessels need to stay by the quay for several days in order to manage its cargo without preventing other vessels to call the port.

In the *Port of Gothenburg* there is only one pilot operator, one towage company and one linesmen company. One respondent believes that it is preferable with only one actor, assumed that the service is at a good level, since lower prices might compromise safety. It is worth to mention that it during a period of time where competition within boatmen´s and tugboat operator´s services, this resulted in reduced prices. As a result the additional operators went bankrupt and had to shut down their operations. Some actors experience that the *Gothenburg Port Authority* has a monopoly position since it is the only port in Sweden where the largest container vessels can call. Therefore the shipping companies cannot choose another port in Sweden. Some actors are dissatisfied with this since the actors in a monopoly position, including the Port Authority, can have too much power without losing cargo. Another the risk with this situation is that actors choose to remove port calls to the *Port of Gothenburg*. The company which is operating the terminal has a monopoly position and belongs to the same organisation as one of the shipping companies calling the terminal. This situation is questioned by other actors because it is perceived as the terminal prioritising the shipping company within the same corporate family.

4.3.2.1 Competitiveness with other ports

The *Port of Gothenburg* has during a long time worked well without major disturbances from competitive threats and the actors have experienced the *Port of Gothenburg* as a good port without any larger problems which also is illustrated by the flow of volumes, see *figure 1*. Although, according to one respondent the conditions have changed, due to changed market requirements.

If the *Port of Gothenburg* does not work well, shipping companies can chose other ports. However, as mentioned before the largest vessels cannot call any other port in Sweden due to the draught and if the cargo does not pass Gothenburg some of the volumes will not pass through Sweden at all. Hence, Swedish economy is affected by the lost volumes. Another possible scenario is that other smaller ports in Sweden for example Helsingborg, Gävle and Stockholm gain benefits if the shipping companies choose to use smaller feeder boats to those ports when the goods consignee is in the region. This kind of development is not desirable for the actors within the *Port of Gothenburg*. Though, according to one respondent the smaller ports can only grow to a certain extent. When a certain level is reached, the smaller terminals need to expand and upgrade the terminals.

Several of the respondents have expressed that shipping companies have chosen to call other ports due to the high expenses when calling the *Port of Gothenburg*. Due to recent shortcomings on the terminal some shipping companies have actively chosen to redirect lines because of the poor service, the inertia at the terminal and the fact that the terminal has not delivered according to contract.

4.3.2.2 Customer focus for competitive advantage

One of the interviewees argues the *Port Authority* as well as the terminal need a greater customer focus. The interviewed shipping companies expect a good and positive service from the terminal since the terminal is a service company even when the vessels are late. Further the shipping companies expect that the terminal always has crew ready, a quay position and that the terminal can load the containers in a timely manner, which some respondents argue is not always fulfilled today.

In the case of feeder vessel the customers decides where the cargo should go rather than the shipping company itself. It is important that the terminal and the *Port Authority* also consider the perspective of the customer´s customer, since it is the freight-payer who pay for the service and choose the route for the cargo. Awareness about effects on the customer´s customers from delays and problems concerning the arrival- and departure process is important according one respondent. For example companies inventories can be empty and in a long-term perspective other actors are influenced of less port calls to Gothenburg as a result from negative effects occurring during arrivals and departures. It also needs to be considered that the shipping companies have many port to calls in their network, hence the shipping companies need a holistic view and planning. According to some respondents it is important to consider that the shipping companies only are looking to their own interest. Instead it is important to have a holistic view to consider the whole process in order to be able to deliver a satisfying service and get the most efficient process for all actors involved.

4.3.3 Delays

Delays easily occur, some factors are hard to predict and it is therefore hard to make an accurate plan. In most cases no serious problems occur during the arrivals and departures. However, the problems that do occur is mostly notable during the departures, specifically the departures of the largest vessels. From the interviews it has become clear that time related information is usually underestimated and the arrivals and departures are planned with a great deal of time optimism. One part that many

respondents mentioned often takes longer than estimated is the departure, as well as loading and unloading. Sometimes, some actors are aware of that the time plan is not realistic but due to various reasons this information does not reach others. There are personal differences regarding to what extent individuals inform others. If information concerning a delay is spread to all involved actors possibilities for replanning is created. One speculation regarding the reason for this problem presented during the interviews is that no one want to be held accountable for a ship staying at the quay longer than absolutely necessary. One suggestion from one respondent on how to solve the problem with tight schedules is to always add buffer time. However, the same respondent thought that this will directly be questioned by the shipping companies since having vessels at the quay longer than necessary is expensive. Furthermore, when comparing with previous arrivals at the same terminal the shipping companies are aware of the previous time for operations and then the agent or shipping company reserves pilots and tugs earlier than the given Estimated Time of Departure (ETD).

Vessels usually have tight schedules but also the quay planning can be tight. Commonly, the plan is that one ship should depart at the same time as another should arrive. This can cause problems, for example it might be planned that some of the resources, e.g. pilots or tugboats, were supposed to support both vessels, although due to delays more resources will be needed. All actors wishes to maximise the utilisation of resources and with timely information it is easier to adapt the schedule for different actors. Due to the difficulty to predict certain aspects it is hard to make an accurate planning and since no one wants to be responsible for vessels waiting to depart, often someone takes a chance and orders pilots, tugs and linesmen too early.

Another aspect that can cause delays is that the vessel has not ordered enough tugboats and therefore have to wait for the extra tugboat to arrive. Moreover, different actors have different goals regarding the flow. From the terminal perspective an even flow of vessels and containers is preferable. Though, for the shipping companies it is hard to ensure arrivals at an exact time, it is easier to give an accurate estimate closer to the actual arrival. This complicates the situation for other actors, since it becomes harder to plan the resources around the arrival. One representative from a shipping company mentioned that when their vessels are running late labour problems often occur during loading and unloading. The respondent also mentions that having more flexible staffing in Gothenburg would make the port more attractive from shipping company perspective.

Delays causes cost trade-offs for the shipping companies. Having other actors waiting causes penalties. However, this cost might in some cases be considered much smaller than having the vessel staying extra time at the quay when ready for departure. Another scenario is that the shipping company decides to load some extra containers even though this will cause an extra cost. Some of the shipping companies are very keen on departing exactly as planned since half an hour extra results in increased bunker costs etc.

The actors optimistic time perception creates impacts such as stress, which for instance impact arrival and departure request and leads to that resources are tied up for too long. Furthermore, one effect for the actors with high service level and with the objective to never let a ship wait are that employees off duty are called at short notice. Hence the actors' plans and operations are affected and the waiting times creates effects on other actors in the process. To which extent the effect has an impact depends on the actors flexibility. In the worst case actors are forced to leave missions. Additionally, one actor's service level makes no difference if someone else is late, delays will still occur. Waiting time blocks

resources for other missions, for example missions in other terminals within the port, which is a part of the costs of the delay.

Another dimension of the delays and waiting is the environmental impact. If information about the delay is communicated the environmental impact can be reduced, for example it can prevent impact from tugboats standing on idle or prevent container vessels who has been anchored outside at Trubaduren, to start the machinery too early. If the information is received at an early stage the vessel can adjust its speed out at sea and thereby save fuel as well as reduce the environmental impact. It is a question of fuel consumption as well as economic consideration but it can also lead to a dissatisfied customer, since the captain need to slow down the vessel's speed in the archipelago. A consequence from that the vessel is forced to slow down in the fairway is that other ships are interfered. The worst case scenario is that a vessel already waiting in the river for the quay to be available and is therefore forced to turn around and go out to Trubaduren or Rivö again, though this situation is extremely rare.

4.3.4 Information and communication

Information and communication are prerequisites for well functioning and efficient prot call process. Correct time estimates and correct reservations, for instance correct number of tugboats needed, as well as information regarding the depth of incoming ships is critical. Further, it is important that the information is received by the right person at the right time. For some of the actors timely information is important in order to plan the resource allocation and to assure availability of services. Communication is also important in order to coordinate resources. For example when resources are scarce due to a sudden increase in demand when several vessels need assistance at the same time. In these situation communication is needed to coordinate and optimise the resources. One alternative is to have more boats and tugboats, but this is expensive and no actors are willing to bear the cost of having boats just as spare capacity.

Updating information when changes occur is considered a problem today. There are individual differences concerning updating information, some are better than others at updating. Generally, information sharing is better during office hours, partly because people sleep and partly because the staffing is lower during night time. Another obstacle for information sharing is that some people are for various reasons unwilling to share information. Additionally, it is not always obvious who is obligated to find, or communicate the correct information. Many of the interviewees consider continuous update of information positive because when information is up to date and reliable the actors do not have to call and disturb others. Today, there are several actors perceiving that they have to chase information by calling repeatedly.

One respondent believes that in order for the communication to be well functioning it is important to decide routines for communication and that the actors within the port collectively decides the communication structure. This could clarify roles and responsibilities for the involved actors. Within the port there are already several initiatives to improve the communication. For example, through *Gothenburg Approach* the communication between *Port Control* and *Swedish Maritime Administration* has improved after being located in the same room. Another example are the meetings held by the pilots and the tugboat crew where these actors occasionally meet to discuss and create a common terminology to make the operation easier. Also other stakeholders have similar meetings. Lastly, the Port CDM initiative is aimed as an enabler for information sharing.

4.3.4.1 *Unreliable and incorrect information*

Sometimes situations occur when different actors are informed with different time estimates for the same occasion, then it is difficult to know which information is correct and where and how the deficiency arose. As a result actors have to make many calls in order to find the correct time. Often information is questioned because actors presuppose the times are optimistically estimated. Another problem which can occur is that inaccurate information is disseminated, for instance about the draught of the ship. The draught can also be a problem during low tide. Then the ship either has to wait for water level to rise or adjust the ballast level, both options are time consuming. As a result of not communicating changes or changed quay position, for example hauling can be required which leads to extra expenses.

Some actors request immediate updates when delays and changes occur. During special circumstances many actors wishes to get informed. Some of the stakeholders demand information from the terminal about the situation at the terminal and why the delays occur etc. Furthermore, only the terminal has insight about the status of the loading and unloading operation, many other actors ask for more insight in order be informed about the situation and when loading operations will be completed.

4.3.4.2 *Waiting times*

Figure 10 below illustrates the accumulated hours for delays and it is based on statistics reported by the pilots. Therefore only the pilots perspective is represented in the statistics, the waiting times for other actors are not accounted for. The estimate from 2015 is based on data from the 1st of January until the 16th of April. In the estimate the delays are assumed to be approximately the same the whole year.

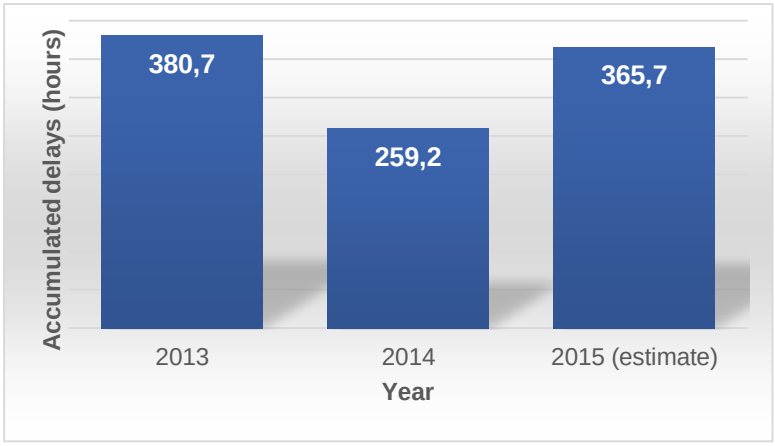

Figure 10: The accumulated times for delays (hours)

If delays are not communicated the actors will be on site waiting for the operations to start which tie up resources. Pilot, tugboats and linesmen often wait on site, especially at the departures of large vessels. In addition to unproductive time for actors it also leads to higher fuel consumption which both is a cost and has a significant environmental impact. Also other ships can be affected since it is not possible to approach the quay. If the actors are aware of the delays one can for instance request another incoming ship to slow down the speed. This can create extra expenses and it can also imply safety risks for the inbound vessel. Hence a shipping company is influenced when a competitor gets problems at the terminal. In addition one respondent declared it is unfair since the vessel which is not the one creating problem and causing delays get a more expensive port call. The costs for the effects is in particular reflected in terms of dissatisfied customers. Some believe that through more realistic time estimates port calls to Gothenburg will be less expensive. According to some actors it is always some

waiting time, sometimes just a few minutes but sometimes “outrageously much”. One of the respondents suggested a just-in-time solution, where the exact ETA or ETD for the ship is given, so other actors know exactly when to start the operations. A counterargument to the just-in-time solution is that the shipping companies pay for service and hence expect a certain degree of stand-by.

The regulations related to the pilotages times can in some cases be difficult to follow and the times are not always updated which sometimes lead to that the pilot is on board waiting. Some actors choose to not make any changes or updates due to the fee for changing the time for pilot and tugboats. One respondent believe the reason for this course of action is that it is easier to motivate a higher pilotage charge than one additional ordering cost since the shipping agent can be liable for the expense. As mentioned earlier some of the shipping companies have a really tight time schedule and the companies want the vessel to depart as soon as the cargo loading is completed. With no buffer time, there are no room for any disturbances during the three hours. When something nevertheless happen, the operations could take longer time and the pilot has to wait on board. No one want to be responsible and take a decision which leads to waiting time by the quay for the vessel. Waiting time can lead to a cost deviation from the agreement, therefore in some cases it sometimes is perceived cheaper to have the pilot on board waiting in relation to the delay charge.

A pilot can sometimes be on board one hour and waiting for departure even though pilots can leave for other jobs as early as after half an hour according to the regulations. One possible scenario which could happen if there are major delays is that the pilot leaves the ship to perform other tasks, however this has never happened yet. The ships or the captain must in the potential scenario request a new pilot which can imply up to five hours waiting for pilotage for the vessel, according to one respondent this would be catastrophic. One respondent suggested this situation should be explained for the shipping companies in order to create an understanding for why some extra buffer time should be involved. Even though the shipping companies consider waiting in one and a half hour to be devastating it is the better alternative compared to waiting for five hours, which is the option.

During the interviews it appeared that many stakeholders perceive the pilot ordering system as rigid since it can happen incredibly much during the three last hours before pilotage. One speculation regarding these rules presented during one of the interviews was that shorter pilotage ordering times would result in higher time accuracy, since it is easier to make a more accurate assessment for the departure closer to the actual time. A proposal to shorten the time to one and a half hour emerged during an interview in order to investigate what effect it will give and then evaluate the trial. The arguments against the proposal concern the fact that the time regulations are determined by the *Swedish Maritime Administration* which is a governmental agency with a framework applicable for entire Sweden. Also, the pilots have one and a half hour response time after the call from the *pilot ordering function*. Probably the time rules works fine in other cities, therefore the *Swedish Maritime Administration* chose to use the same regulations in all ports in Sweden, including Gothenburg.

4.3.4.3 IT-systems

Different actors have different IT-systems, one explanation for this is that the actors working in the *Port of Gothenburg* are either global, national or local. If there was only one IT-system in the *Port of Gothenburg* the global actors would have different IT-systems in all ports the actors are operating in worldwide, which would be unreasonable. One current problem connected to the different actors usage of different IT-systems is different times reported in the systems regarding for example an arrival or

departure (ETA or ETD). When something has changed it is not always sure the new information reaches all concerned, or is updated in all systems.

There are ongoing initiatives within the ICT (Information and Communication Technology) area where different actors are more or less involved. During the summer of 2015 the new IT-system Port-IT will be implemented, many actors are optimistic and believe it will minimise issues regarding conflicting information. Another example is the EU-project Mona Lisa, with the objective to propose, demonstrate and evaluate how ICT can be used to improve efficiency of marine traffic from port to port. One example of improvement potential is to enable planning of the routes as environmentally friendly as possible by automatic exchange of route planning information as soon as it becomes available.

One part of the MONALISA project is PORT CDM (Collaborative Decision Making) which is initially demonstrated in Gothenburg and Valencia with focus on achieving more effective port calls. This will be enabled through collecting data to an information-hub, for instance in order to reduce the need for peer-to-peer communication (e.g. phone calls, short-wave radio or email). The information-hub will serve as an enabler, a platform for information sharing.

4.4 The container terminal

This section contain at description of the container terminal in the Port of Gothenburg it also include a short description of the current state at the terminal.

Several of the terminal's customers believes that the terminal operator is highly skilled and competent and many actors have experienced significant improvement in safety since the new operator took over the operation of the terminal. The local daily newspaper, Göteborgs Posten, also confirmed the safety focus at the terminal and the improvements (Löfgren, 2013). After taking over the terminal large investments have been made. The actors interviewed have mentioned that the upgrades were necessary and appreciated, however not at any price, there is a limit to what the customers are willing to pay and willing to accept in regards to interference during the upgrades.

During the handling of large vessels many operations happen concurrently and up to five cranes are working with the loading and unloading operation. The number of cranes used is based on the original loading plan provided by the shipping companies and if containers are misplaced it can cause disturbances. All of the cranes need to work in the same pace or else the lashing of containers will be delayed. Crane breakdowns or downtime on one crane can cause severe delays since the containers are organised in accordance with where on the ship the containers should be loaded. Problems occur when something unexpected happens, as for example some of the containers need to be moved in order for all of them to be loaded. The captain must then be contacted to discuss priorities and how to handle the particular situation. The easiest solution would be to let the ship sail at the scheduled time even though this means that some of the containers are left at the terminal. On the other hand, this would make the shipping companies dissatisfied. Congestion occurring in other ports can lead to that the ships misses their agreed windows in Gothenburg. When missing the windows the terminal in Gothenburg could decide to decline providing the shipping company with service. However, the terminal always tries to solve the problem in some way for example by giving the shipping company the opportunity to come at a later window or in the best case scenario another customer is a little bit early and the customers could therefore switch windows. The fact that Maersk and APM Terminals are in the same corporate family is a factor which has made some shipping companies annoyed. The perception is that Maersk's vessels are prioritised which have been questioned.

During the arrivals of the largest vessels, when much cargo is supposed to be loaded and unloaded, the terminal has around 60-70 persons ready in order to assure that the service can be provided. If a delay occurs, the employees on site have nothing to do. The fee generated from the shipping company is relatively small in comparison to the revenue from the containers the terminal could have handled during this time. An additional factor which can cause problems at the terminal is that additional containers which are not accounted and included in the plan are discovered during loading or unloading. It is therefore unknown where these containers are headed and these containers could suddenly cause extra hours for loading and unloading. The responsible shipping company needs to be contacted to sort out the problem and to decide if any prioritisation needs to be done. Problems are often observed when there are only a few containers left. The situation at the terminal changes quickly and problems usually occur when it is already too late and delays are inevitable. If the terminal operators had knowledge about this at an earlier stage the problem might have been solved. Another issue that could occur is that the straddle fork lifts break down or that the change of driver coincide with an inappropriate time in the loading operations. All this issues described can be potential factors causing delays. Moreover, it has emerged that the labour unions are powerful players with a lot of influence over the situation at the terminal which can influence the operations at the terminal.

4.4.1 The current situation at the container terminal

The terminal operator has since the corporate change in 2012 made comprehensive investments in order to upgrade the terminal. During the beginning of 2015 the container terminal has undergone several upgrades and this has influenced the efficiency at the terminal negatively. The upgrades have led to an extremely tight situation and the terminal has thereby not been able to deliver according to agreements. The latest disturbances at the terminal have resulted in situations when the terminal has been forced to let vessels depart despite not all export containers have been loaded as planned. This situation is temporary but have although escalated since the beginning of February 2015. One respondent expressed that it is understandable that the terminal company want their investment back but at the same time argues the service has become too expensive too fast and the terminal investments were too comprehensive.

Several respondents points out that it during times of upgrades it has been low efficiency at the terminal which in some cases has led to that not all cargo has been handled. In some cases the shipping companies have had no choice but to leave several containers in Gothenburg or in other ports. One respondent exemplified about how one of their vessels once had to leave around 100 containers at another port because these could not be unloaded in Gothenburg due to the low efficiency and partly due to the congestion caused by the low efficiency. Another respondent mentions that due to the low efficiency at the terminal the terminal has been forced to decrease the move counts, meaning that the shipping companies have received restrictions on how many containers which can be handled per hour and thereby reducing the turnover for the shipping companies. One of the reasons for the reduced move count is that the space at the terminal has become scarce and it has been harder than estimated to increase the capacity of the new cranes. At the terminal area too many empty containers have created congestion which has made the logistical work for truck drivers more challenging. It has thereby become harder to find one specific container since there are over 8000 containers at the terminal area, which also influence the efficiency negatively. Several respondents have expressed the price level at the terminal as very high especially since the service level has been low which has caused frustration among the shipping companies. One representative from a shipping company explains that their shipping

company are aware of the situation with the conversion is unusual but still believes that it has influenced their and their customers business unacceptably much.

Today there is a very high degree of utilisation in the terminal area which creates challenges for the terminal crew to manage the containers since there is a need for space to maneuver. Problems are created when the operators are forced to search for locations to place or to retrieve the containers. As a result the operations take longer time, which in turn leads to decreased efficiency hence the vessel will be at quay longer. Longer time in port creates obstacles for the next vessel in turn, i.e. domino effects are created.

4.5 Other challenging factors

In this section additional factors which needs to be considered are mentioned.

4.5.1 Infrastructure and cargo flow

Issues occurring at any stage in the transport chains passing the terminal can affect the port operations. For example, if trains or trucks do not arrive on time with the cargo, the cargo misses the opportunity to get exported by the planned vessel. Also maintenance on the railway tracks as well as congestion at the roads can affect the times for departure of vessels. Further, it is from the terminal perspective problematic with an uneven flow of containers since it creates high costs and can cause congestion which causes problems such as for example delays. When it comes to transports by train or vessels the terminal is aware of the schedule for these transports. Road transports comes unannounced and are usually concentrated during certain times, similarly as the car traffic at the roads during peak hours. Another effect which occur when vessels only unload containers without loading export goods is that congestion is created within the port area. In turn the congestion increase the pressure on the truck traffic.

The arrival and departure process consist of many small and complex parts and the different parts in the process affect and connect to each other in a complex way which is important to understand. One respondent explains that it might be easy to think that the problems with delays could have been solved by letting the vessels depart, finished or not. However, besides making the shipping companies annoyed this also causes congestion at the terminal due to that the export is not loaded on the ships. This congestion will be intensified if also trucks and trains leave a lot of cargo at the terminal. In order for the terminal area to be used in an efficient way it is therefore important with an appropriate mix of import and export. The amount of import and export are also affected by the economic situation in Sweden. Another issue is that the flow of vessels to Gothenburg is uneven and several things are supposed to be done at approximately the same time. This makes it harder to allocate resources in an appropriate way. Furthermore, different actors value different things. For example, some shipping companies value punctuality while other shipping companies are keener on achieving as high filling rate as possible.

4.5.2 Weather

The weather is a factor which can have great effect on the operations during arrivals and departures. Departures are more sensitive than arrivals when it comes to strong wind and it can cause problems when the ships leave the quay. Tugboats are used during the arrivals and departure process in order to assure a safe mooring and unmooring. The shipping companies are not willing to risk the cost of ordering more tugs than necessary and this together with changed weather conditions can cause delays. When it comes to weather it is hard to predict and changes can happen fast and therefore makes the planning

harder. Bad weather can affect the time for arrivals and departures negatively. This does not only concern the local weather in Gothenburg but can also depend upon previous weather related situations. For instance, ports are forced to close down due to storms and due to this the vessels cannot make their scheduled slots in subsequent ports. The climate change worldwide has delivered more storms which also makes the vessel scheduling and planning more problematic. Also high and low tide have an impact in Gothenburg, but this factor is of much more influential elsewhere around the globe. Sea rescue services can also influence the arrivals and departures since some actors under these circumstances leave current missions in order to support the rescuing mission. A weather related suggestion from one shipping company is weather related updates from the *Port of Gothenburg*. The respondent noted that there are of course global weather forecast but local well updated information from the local port might be more accurate and recent and therefore appreciated from the shipping companies.

4.5.3 Variation in working routines

During the interviews there were also other problems and factors which were mentioned as important. For instance, one respondent mentioned that ports and terminals around the world have different ways of working, there are for example different safety regulations. Further, different shipping companies have different routines for ordering for example linesmen in Gothenburg. It usually is done by the *Swedish Maritime Administration*'s function *Vessel Traffic Service*. In contrast, some captains instead have direct contact with the linesmen. Another example of variation in communication routines are the communication between *Port Control* and the different terminals. Mostly the communication tool is telephone. However, one respondent mentioned that besides using the telephone also Lync (Microsoft's communication tool) was used in the communication between *Port Control* and the energy port. The respondent perceived this as a practical solution since it decreases the risk of calling at inappropriate times as well as calling too often. When using telephone it is usual that the person having questions instead waits to call until having several questions in order not to call too often.

5 Analysis

In this chapter the empirical findings will be analysed through the frame of references. First, the competitive situation for the port industry will be explained, followed by the competitive situation in the Port of Gothenburg.

5.1 The competitive situation in the port industry

In this section the competitive situation in the port industry will be analysed. First the general competitive situation through the lens of literature and research followed by the competitive position for the Port of Gothenburg.

5.1.1 The competitive situation from a theoretical perspective

As mentioned earlier in the frame of references, when competing as a focal hub for containerised cargo it is important to think beyond traditional boundaries (Yap, 2009) especially since market requirements are changing. Ports today are operating in a competitive environment (Robinson, 2002) and changed market conditions put pressure on port development. The pressure on ports to reduce their environmental impact is also increasing (UNCTAD, 2014). Ports today have to compete for cargo and does not only compete with their closest neighbours but within a greater region (Notteboom and Yap, 2012) and competition occur between complete supply chains (Robinson, 2002). Consequently, it can be concluded that competition always is present in the port industry at different levels (Notteboom and Yap, 2012).

How the port is managed can affect the competitiveness and make the port attractive for container carriers (Alderton, 2008). To manage service requirements from the customers efficiently and stay competitive immense investments and improvements are required (Peters, 2001). There are many factors affecting the competitiveness including; intermodal access connectivity to hinterland (Alderton, 2008; Notteboom and Yap, 2012), closeness to key production, low port cost to users due to high efficiency, the ability to offer value adding services, the ability to expand over time, the ability to help the users to compete efficiently with other transportation modes, strong support from key stakeholders (Yap, 2009; Notteboom and Yap, 2012) and the level of supply chain orientation (Tongzon et al., 2009; Zhang et al., 2013). Moreover, it is the total service package provided by the port community which determine a container port's competitiveness (Yap, 2009; Notteboom and Yap, 2012). In order for an organisation to sustain a competitive advantage it is required to continuously develop and improve compared to its competitors in terms of quality, time and cost (Gordon et al., 2005). In the Port of Singapore, competitive advantage was gained by working with terminal operations and information technology and by assuring value adding services (Gordon et al., 2005). According to Alderton (2009) also competitive costs and reliable service affect the competitiveness between ports. Additionally, according to Yap (2009) and Notteboom and Yap (2012) the port cost for the users can be lower through increased efficiency. The efficiency of the operations within the port can also be an important factor for competitiveness (Yap, 2009; Notteboom and Yap, 2012) and a key indicator of efficiency is turnaround times in port (Ducruet and Merk, 2013). Further, some of the interviewees believe that through more realistic time estimates port calls to Gothenburg will be less expensive.

5.1.2 The competitive position for the Port of Gothenburg

The following analysis has been performed from the *Port of Gothenburg´*s perspective and reflects the current situation. Porter's five forces framework has been used as a complement to add another dimension to the findings from the literature review regarding what creates competitiveness for the

port community. In addition, when it comes to the force the power of suppliers it is not applicable at all for this case since no suppliers exist in that sense. Instead it is a matter of managing the stakeholders in the port community which will be addressed later in the analysis, see *section 5.2 The competitive situation for the port community in Gothenburg*. In the analysis below the buyers correspond to the shipping companies and vessels.

5.1.2.1 Threat of entry

In order to enter the industry huge investments are required and it requires time to get return on investments. The investments have to cover facilities, environmental protection and legislation as well as machines etc. Investments are required since there is a pressure for terminal capacity and more advanced cargo-handling technology. Besides the forces, Porter (2008) suggest that there are also some factors which influence the forces. For instance, the influence of government is stronger when it concerns building a new port, since the initial construction can influence for instance wildlife and the surrounding environment. The influence is weaker when it regards an expansion and development of an existing port. The infrastructure, in particular the railway to and from the *Port of Gothenburg*, is a complement which also influences the five competitive forces. For example, infrastructure creates unequal distribution channels which creates a barrier to entry. Additionally, the infrastructure favours the already existing ports with developed infrastructure. The connectivity to surrounding infrastructure thereby contribute to the possibilities for achieving economies of scale.

5.1.2.2 *Rivalry among existing ports and bargaining power of the shipping companies*

As stated in the literature the shipping companies base their choice of port on factors like costs, reliability, and surrounding infrastructure (Alderton, 2008; Notteboom and Yap, 2012). Also the access to resources such as tug boats and pilots as well as access to infrastructure are important. Port costs are for the shipping companies a significant part of their total costs and the shipping companies are therefore price sensitive. Hence, the shipping companies tend to look for other alternative ports to call, which have been confirmed in the interviews. However, in the Scandinavian countries the *Port of Gothenburg* is the only port with the capacity for the largest container vessels. This in term decreases the power of the shipping companies if the goods are to be transported via Sweden.

The competing ports are numerous and different ports offer the same services for the shipping companies and there are no direct costs associated with switching ports. This makes it relatively easy for the shipping companies to switch. Existing ports can gain market shares from the *Port of Gothenburg* for example by expanding or by enabling possibilities for receiving deep sea vessels and existing ports thereby constitute as a threat since these ports could enter a new segment. Furthermore, the industry is to some extent regulated by governmental policies and legislation, for instance environmental aspects, customs, different policies and the governmental regulations can affect the competition between ports. Many of the governmental regulations are the same for Swedish ports and therefore do not affect the competitive situations between different ports in Sweden. However, from an international perspective governmental regulations can have greater effect on the competitiveness.

5.1.2.3 Threat of substitutes

It is hard to substitute a port as well as the services and functions ports are providing. Nonetheless, there are some substitutes to ports, such as air transports but it is dependent on the customers' willingness to pay and have a considerably larger environmental impact. As presented in the literature, container shipping is cost efficient and has a low environmental impact compared to other transportation modes (Griggs, 2013; UNCTAD, 2014). Also road transports are a substitute to ports.

However, at some point the cargo needs to be transported between continents and this cannot be done by road transport. Another substitute is not having any sea transports, for example by establishing local production to a higher extent, which also can be interpreted as a threat to the whole transportation industry. Moreover, it is also worth to notice the container industry as an important and substantial contributor for the global economy (Peters, 2001). Nevertheless, shipping companies can choose feeder traffic instead to other Swedish ports if the service is not good enough in Gothenburg. In this case parts of the cargo volumes are lost for Sweden, hence the Swedish economy is affected and it would also lead to increased rivalry between existing national ports.

5.1.2.4 Conclusion of the competitive situation

First, the threat of entry when it comes to new ports is low but the development of already existing ports is a larger threat. Also, there are numerous ports and the rivalry among ports is high. The shipping companies have a relative strong bargaining power since it is easy to change port. Moreover, the threat of substitutes is low when it concerns substitutes for ports even though substituting part of sea transport with road transports increase this threat. Although, when it comes to substitutes for direct traffic to Gothenburg, feeder traffic seems to be an increased threat since it can result in that cargo will not be transported via Gothenburg. This increases the bargaining power of the shipping companies, especially the largest companies. In the analysis it became clear that the power of the shipping companies is the most significant hence this power needs to be considered by the port community. Furthermore, Tongzon et al. (2009) propose that it is strategically important for the whole port community to have a good relationship with the shipping companies (Tongzon et al., 2009). The concluding remarks reveal the current situation of the industry and therefore the *Port of Gothenburg* is required to consider these circumstances, which therefore will be used for continued analysis below.

5.2 The competitive situation for the port community in Gothenburg

In this section the port community's competitive situation will be described and analysed based on the empirical finding and previous analysis. Quality focus for increased competitiveness, aligning the actors in port community, enhancing the quality of information and communication and reducing unproductive time in order to increase the competitiveness will be presented below.

In order to capture and understand the complexity this study utilises stakeholder management theories for the analysis. This because the port community consist of different stakeholders and it is not as easy to affect other external stakeholders as it is for a company to affect the internal organisation. Also quality and *Supply chain management* principles will be considered in the analysis. This in order to illustrate how the service package delivered by the port community of Gothenburg is perceived by the customer. Also the case studies from the frame of references will be used as a source of inspiration in order to see how similar problems experienced in the *Port of Gothenburg* have been tackled elsewhere.

5.2.1 Quality focus for increased competitiveness

The *Port of Gothenburg* is Scandinavia's largest port and has with its geographical location and the well-developed infrastructure an advantage compared to other ports in Scandinavia. In order to come closer to realising the vision *"The Port of Gothenburg will be the obvious freight hub for sea transport in Scandinavia"* (Göteborgs Hamn, 2014a) an increased quality focus is a way to increase the competitiveness which is supported by the definition of competitiveness, see section 2.2.1, where price and quality are the basis for competitiveness. This is well aligned with the *Port of Gothenburg*'s vision as well as with the wish to reduce costs.

Furthermore, the competitiveness of the port community depends on the quality of the service provided by the whole port community. As explained in the frame of references, it is the total service package offered by the whole port community and its actors which determines the competitiveness (Yap, 2009; Notteboom and Yap, 2012). It is the actors within the port community in Gothenburg which together deliver the service package. The service package refers to the different services provided by the individual companies within the port community which together are part of the total service delivered by the *Port of Gothenburg* to the vessels and the shipping companies. It is challenging that the different actors have limited possibilities to control each other which can cause sub-optimisations in the whole system which in turn creates inefficiencies, costs and unproductive time. Increased collaboration between the actors could be one way of raising the level of understanding of how to optimise the whole process instead rather than optimising towards individual corporate goals. Workshops, projects and other collaborations between the actors enhance and improve the understanding of the roles of each other and provide better opportunities for aligning the actors within the port community.

5.2.2 Aligning the actors in the port community

In order to achieve high competitiveness supply chain orientation is necessary (Tongzon et al., 2009). In order to enhance and increase the competitiveness it is vital to consider the whole supply chain and strive towards maximisation of the whole chain's profit (Zhang et al., 2013). It is important for the *Port of Gothenburg* to have a holistic perspective and to consider all sub-processes within the arrival and departure process. An increased process orientation can contribute to higher quality of the service and hence also the port's competitiveness. In the case of *Port of Gothenburg* it is important to consider customers and customer´s customer who are paying for the freight and choosing transport chain. It is important to be aware of that problems in the port call process can have negative impacts on all customers in the supply chain.

Moreover, it is important with cooperation and coordination between the actors involved in the arrival and departure process as Tongzon et al. (2009) propose. It is also important that the solution is beneficial for all involved actors. The importance of supply chain orientation was also confirmed in the case of the Canadian National Railway. The initiative involved establishing contracts between actors in order to facilitate structural collaborations between the actors in the supply chain, hence possibilities for increased level of collaborations was achieved. Thereby also the interfaces between actors in the supply chain were improved as well. The CEO of Canadian National Railway, Claude Mongeau, argues the agreements have been good for all actors involved, in particular in the combination with the right organisation, the right mindset and the right metrics (The Globe and Mail, 2010). Establishing similar agreements as in Canada between the actors in the port community could also be useful in Gothenburg. Further, according to Eide et al. (2011) structural changes, relating to for example logistics or planning, where two or more parties together develop solutions have high potential to increase efficiency or reduce emissions. It is relatively hard to achieve integration and joint development and it requires stakeholder management. In the port community of Gothenburg there are many actors involved and stakeholder issues are therefore important to consider. Stakeholders have been recognised by Greiman (2013) as important participants in development efforts. Moreover, balancing conflicting stakeholder interest, dealing with cultural differences and so on are challenges from a management perspective when it comes to stakeholder management (Friedman and Miles, 2006). As presented in the frame of references, the Port of Singapore has been appointed as the best container port in Asia several times. The port has requirements from their customers in different areas such as turn around times and port charges and the ports main objective is to be a major transhipment hub. In order to achieve the

objective and meet the customers' requirements the port has implemented different IT-solutions and thereby enabled time reductions, cost savings, higher flexibility and increased quality. Moreover in order to attain these results the Port of Singapore has developed a quality culture and the workforce has been trained in customer focus. This has according to Gordon et al. (2005) helped the Port of Singapore to sustain highly effective operations as well as a sustained competitive position. The experience from the Port of Singapore can be used as a role model for the *Port of Gothenburg* in order to motivate creation of a culture for quality improvements.

5.2.3 Enhancing the quality of communication and information

From the empirical data collected it has been identified that information and communication are key factors for proper functioning port calls. As can be seen in *figure 11* below as well as in *Appendix C and D*, the communication is quite complicated under normal circumstances.

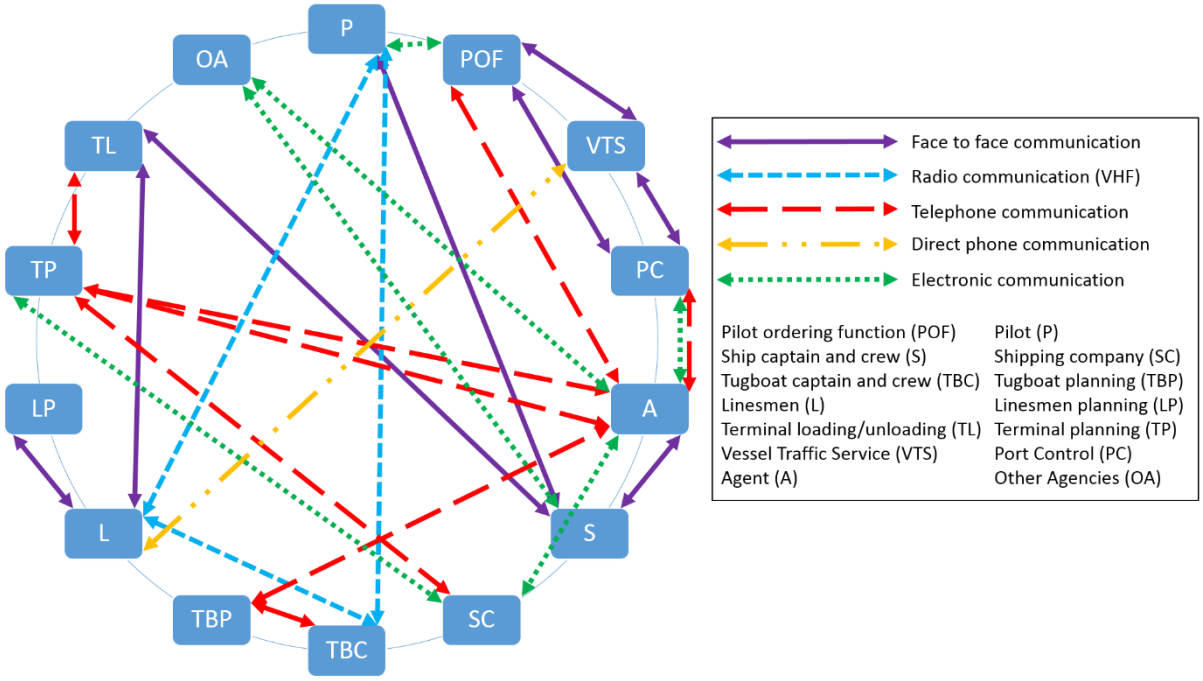

Figure 11: Communication five hours before departure until right before departure

Also some of the actors are central in the communication and are involved in many of the communication flows while other actors does not communicate to a great extent. Furthermore, if something changes the communication will be even more complicated and the need for communication increase, therefore it easily happens that not all concerned are provided with the right information if no clear patterns or standards are established. It can be questioned whether the communication mirrors the actors which possesses the information. For instance during the departure, as can be seen in *figure 11*, there are no direct communication flow between the terminal loading and the waiting actors which is odd since the terminal loading might have the best knowledge about when the ship is loaded and ready for departure. Moreover, another finding from the empirical data is that there seems to be lack of responsibilities regarding communication within the *Port of Gothenburg*. For instance, when time estimates for the same occasion is disseminated the actors have to call around to find right information due to unclear estimates, see *section 4.3.3.1 Unreliable and incorrect information.* A structure for communication and a common language would decrease number of calls required due to poor communication hence non-value adding time could be reduced.

The inconsistency in terms of information sharing routines can cause quality problems for the service related to reliability. The credibility related to time information is also sometimes very low between the different actors, time related information is not always trusted and is often considered too optimistic. Furthermore, access to communication systems and information is vital in order to create increased quality of the service. The lack of access to information within the port community leads to many phone calls, which result in unproductive time for several actors. Also, the inconsistency can depend on that words refer to different things, for instance estimated time for arrivals can refer to when the ship enters the traffic area for some actors and for others it can refer to when the ship is berthed at the quay. The inconsistency affect the IT-systems possibilities to contribute to increased quality, if the data input to the IT-system is poor, the output will be inadequate as well. Moreover, through better routines for the usage of IT-systems the inconsistency in information sharing could be reduced.

Information sharing and mutual trust are required in order to create supply chain integration but it can be challenging to create higher information sharing and trust. The challenges can occur due to confidential information as proposed by Tongzon et al. (2009) which probably is true for the actors within the *Port of Gothenburg* since it seems to be some resistance and unwillingness to share certain information. In order to achieve a successful integration of actors in the port community, the actors must be open to each other (Kanter, 1994) and it requires a willingness to share information. The Port CDM initiative is creating an IT solution which is aimed to enable information sharing. However it is important to consider the finding proposed by Gordon et al. (2005), that an IT solution can not alone create competitive advantage and it is important, to look over the routines for communication and the usage of IT systems. Further, Gordon et al. (2005) propose that competitive advantage arise from a unique combination of resources, which were identified as a key to attain a competitive edge in the Port of Singapore. If implemented well an IT solutions can be a great enabler, the Port of Singapore for instance, managed to increase the quality, reduce time, save cost and achieve higher flexibility in the processes as well as achieving more effective asset utilisation (Gordon et al., 2005).

In the air transportation industry the importance of stakeholders having access to the same information has been identified as an enabler for collaborative decision making (Norin et al., 2007). Today many actors are forced to chase information in the port community of Gothenburg. Through increased transparency among actors the quality of the service could increase. In contrast, without transparency the quality of the decisions is reduced and the need for communication increases. Today some of the actors within the port community deals with confidential information. For instance volume of cargo at the vessels are confidential and only the terminal has insight in the cargo operations. Many actors request more insight in the cargo operations in order to plan and be proactive.

5.2.4 Reducing unproductive time in order to increase the competitiveness

According to several respondents the *Port of Gothenburg* is today a very expensive port to call internationally and nationally. During the interviews it was also revealed that a lot of unproductive time occur in the port call process. Waiting times and unproductive times have several negative impacts in the system for instance increased costs, safety risks and environmental impacts. UNCTAD (2014) mentioned emissions, operations and accidental pollution as areas of impact from port operations. It is important to consider that unproductive time will increase the impact of these areas hence the environmental and economic gains of reducing unproductive time are aligned.

Moreover, as mentioned in the section *4.3.4 Information and communication*, communication is important in order to reduce unproductive time in the system. Unproductive time due to inadequate

communication within and between sub-processes result in increased fuel consumption for many actors within the port, not only for the involved actors in the actual port call process. The speed of a container vessel depend on for example market demands, price of fuels and on the vessel's schedule and high port efficiency therefore allows the vessels to slow steam which have a significant impact from an economic and environmental perspective (Johnson and Styhre, 2014). For example, if the port stay is longer than planned or the service gets delayed due to poor processes it might lead to a subsequent increase in bunker cost in order for the ship to be on time in subsequent ports. Hence, as Johnson and Styhre (2014) propose efficiency in ports as important since it can create possibilities for slow steaming.

Quality problems in the processes within the port community can influence the service negatively, which will lead to higher costs for the shipping company and in turn it can lead to change of route for the cargo. Moreover, from a customer perspective, i.e. vessel or shipping company, the punctuality of actors is important. For example, that pilots, tugs and linesmen are on time in order for the operations to start as planned. Is it important to highlight that reliability is also about being accurate, waiting for operations to start is a deviation and can cause unproductive time which creates costs.

In order to reduce costs and approach the problem with waste and unproductive time in the *Port of Gothenburg*, the service package needs to be continuously evaluated. Continuous improvement is an approach to increase the quality and reduce the cost. In order to allow for continuous improvements data gathering and measurements are prerequisites, since it enables possibilities to follow up and evaluate the improvements continuously (Bergman and Klefsjö, 2010). This could be one approach for the port community to lower the total cost for the services. Currently, the pilots gather data about delays and for an illustration based on this data, see *figure 10*. This should be done to a higher extent since the procedures for data collection are not sufficient today for the purpose of quality management. By systematically collecting and analysing data time estimates and unproductive time can be improved and the most critical improvement areas can be identified.

Furthermore, *as can be seen in the 4.3.4.2 Waiting times*, many stakeholders consider the pilot ordering system as rigid but accept the system since the regulations are the same all over Sweden and are determined by a governmental organisation. The perception which was gained during the interviews was that shorter pilotage ordering times would result in higher time accuracy and enable a more accurate assessment for the departure closer to the actual time, this could be supported by data gathering. For instance if the pilot ordering time were to be decreased to one and a half hour data can enable accurate investigation of the effect and evaluation after a period of the trial. This approach would enable possibilities for improvements and also motivate and create evidence for a change of the time regulations, which probably is justified since the *Port of Gothenburg* is the largest port in Sweden and handles the majority of the volume for container traffic in Sweden, see *figure 1*.

6 Conclusion

In this section the conclusion will be presented. First, a discussion about the recommendations the Port of Gothenburg should undertake followed by a short discussion about future research.

In order to stay competitive and strive towards the vision "The *Port of Gothenburg will be the obvious freight hub for sea transport in Scandinavia*", the organisation needs to improve in terms of quality, time and cost. In the analysis challenges have been presented and based on those challenges we propose some improvement areas, which we think would be beneficial to address from a quality perspective in order to increase the competitiveness for the whole port community. Five concrete suggestions for actions will be presented in order to increase competitiveness and reduce unproductive time and cost. The suggestions can facilitate the challenges related to information quality such as unreliable and incorrect information. The suggestions will also cover improvements of information routines for example when changes occur and the need for a higher degree of transparency.

6.1 Recommendation

The first recommendation is to create a holistic perspective and to establish a common understanding of each other and the process. A holistic perspective is important since it becomes easier to see how the services provided contributes to costs and how these costs in turn creates other costs.

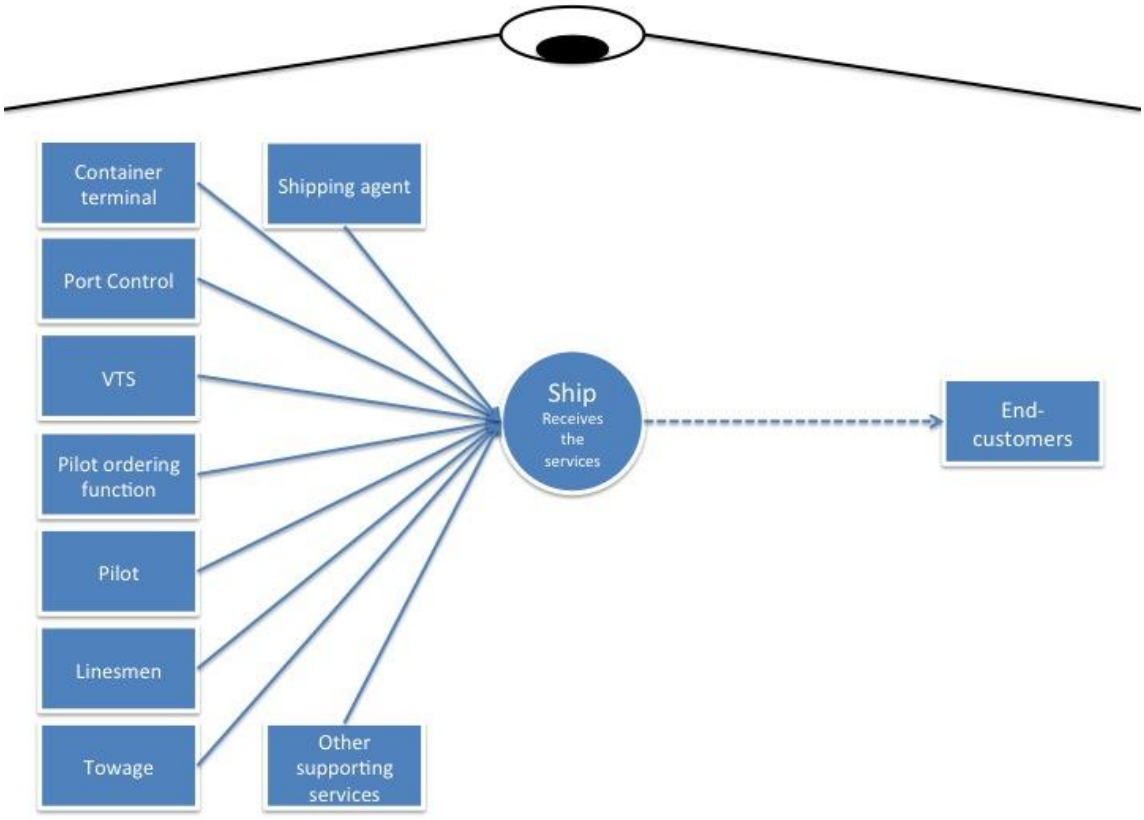

Figure 12: The holistic view of the service delivered by the port community

It is important to look at the port community and the services delivered to the ship from a higher perspective, in order to consider all parts of the process and to satisfy the demand for goods at the market, which is illustrated in *figure 12*. The service delivered to the ships also have an effect on the end customers, which is illustrated by the dashed line in the figure. Moreover, to gain a holistic view of the

process with all stakeholders involved we think it will be strategically beneficial for the *Gothenburg Port Authority* to use the already existing mappings of the stakeholders and then evaluate all relationships to the other actors. The evaluation can then be used as a guideline for how the relationships should be managed on different levels in order to create possibilities to balance conflicting interests and achieve holistic view of the system and create a higher level of collaboration. Hence, get a supply chain focus and manage the supply chain in a more strategic way in order to build competitive advantage. Which is vital since, all the actors with their particular service affect the whole service delivered to the customers. One related challenge is that it is hard for actors to influence other actors which they cannot control. Still, we think it is important to consider how to influence other actors since all actors contribute to the complete service package. Furthermore, we think a holistic view enables high potential for increased quality of the service, and hence increased competitiveness for the port community. To conclude, it is critical to establish a common understanding and a holistic perspective about the process and the challenges the port community faces. There are many ways of approaching the challenges and below some more specific ideas are presented.

In order to gain a common understanding and sustain the competitive advantage and to reduce costs and approach the problem with waste and unproductive time the service package needs to be continuously evaluated and improved. The second proposal is therefore to establish quality meetings with all the actors in the port community in order to improve and follow up on problems together. If everybody involved in those meeting it will create transparency as well as increasing the quality of the service. In the Port of Singapore increased quality and customer focus have been proved very successful, we think it would be beneficial to incorporating such a culture in Gothenburg. The quality meetings with involved stakeholders could be one step towards a culture with a focus on quality. Such meetings can also generate positive effects for the actors' internal culture and create quality focus which also will increase the quality of the service.

The third proposal is to start collecting data and measuring estimated time for departure (ETD) and the actual time for departure (ATD) in a structured way. It can also be beneficial to measure the turnaround times in the port since this is a measurement providing a holistic perspective. If relevant data is collected in a structured way this would enable identification and visualisation of the deficiencies in the port call process and sources to unproductive time would become visible. Hence possibilities to analyse, control and optimise will be enabled. The measurements will also allow to follow-up the variation, which can be useful in order to motivate involved actors to engage in the improvements and strive towards more reliable estimates. Through time measurements, monetary costs for all variation related to the time estimates for departure can be demonstrated and be used as an incentive to motivate actors to contribute to improvements in order to decrease the costs and reduce the unproductive time. For instance, the measurements of the delays reported by the pilots, see *figure 10*. Today the data does not reveal how many actors and persons which are affected by the delays, i.e. the extent of unutilised resources and the real costs for the delays also other costs can be revealed through a more thoroughly data collection and analysis.

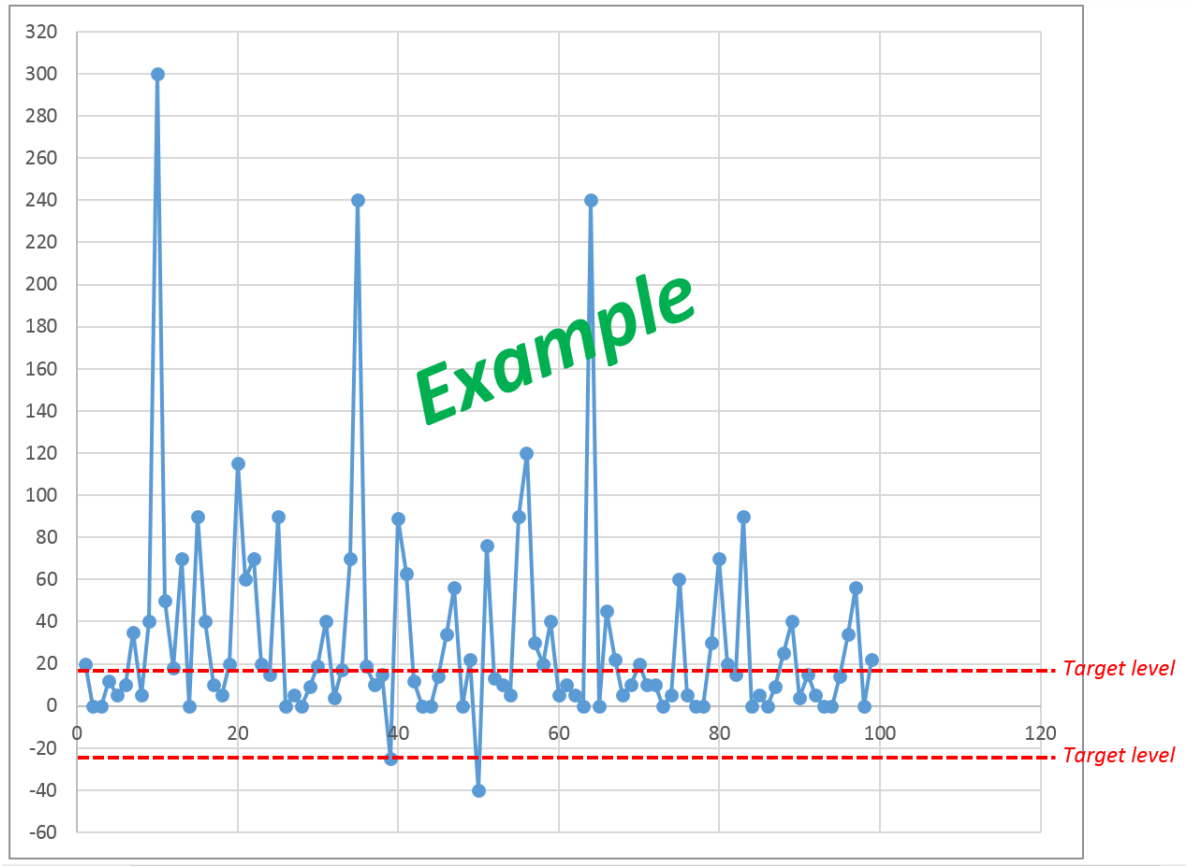

Figure 13: Example figure over the deviations from the estimates in minutes

Figure 13 above presents a fictional illustration of how deviations or delays could be visualised over time. The X-axis shows different arrivals or departures and the deviation from the estimated time is showed in minutes on the Y-axis. It is important to decide what an acceptable level for a deviation is; we call it a target value. The target value can for instance be 20 minutes as in the figure above. This means that deviations or delays less than 20 minutes are not important to investigate and find root causes for. Nevertheless, it is still important to also include arrivals and departures which behave as planned since it gives the possibility to study the process over time and it can show for instance seasonal trends etc. It could also be interesting to separate the arrivals from the departures and instead visualise it with two different charts.

As stated in the analysis, information sharing routines can prevent quality problems caused by unreliable information and lack of information. Therefore the fourth suggestion is to establish clear routines for information sharing and define responsibilities for the different information flows in the port call process. This could increase the quality of the information and create possibilities for reliable and correct information. Today information is not trusted and is questioned which is a severe problem. The unreliable information create unproductive time and cost for the customers and it is therefore important to enable information sharing and communication. We think the challenge is to create routines and structure for information when problem occurs related to the port call. This is especially important since it has appeared that almost all port calls have individual considerations and are unique.

A need for increased transparency between actors has been identified therefore the fifth suggestion is to strive for increased transparency. We have identified tendencies for unwillingness to share information, which we see among other things as evidence for lack of transparency. In order to increase

the competitiveness for the port we think it is important to explain what effect this resistance to share information can have on all actors in terms of unproductive time and cost. Also the positive impact should be explained in order to motivate sharing relevant information. Additionally, it is important since all the actors deliver the service package together which affect the quality of the service. We are aware of that some information is confidential and therefore cannot be disseminated. Thus, ways to share information without revealing confidential information should be identified. For instance the demand for more insight in the loading operations at the terminal can be a challenge since much of the information related to the cargo is confidential as described in the empirical findings. During one workshop a suggestion was proposed to solve the issue, the remaining cargo in percentage could be shared with other actors involved in the port call without sharing confidential information. Moreover, we think it is important for all actors to understand that requirements for information from other might imply that the actors themselves need to share information as well. In order to create transparency, mutual trust, information sharing and mutually beneficial solutions are required. It can be challenging to create, although we think it is important to explain what each actor can gain from sharing information and collaborate with the other actors, subsequently trust will be created.

6.2 Future research

The pressure on ports to reduce their environmental impact is increasing (UNCTAD, 2014). In the future demand for more environmental friendly transportation can be expected to increase. Therefore, we think it is important for the *Port of Gothenburg* to consider an even greater focus on environmental issues, in order for Gothenburg to stay at the cutting edge regarding sustainability. This can become a competitive advantage in the future. Further, it motivates the usage of quality principles since it is a way to utilise resources more efficiently in a long term perspective. The academic contribution of this research is that the researchers through action research have entered a new field through the combination of *quality management* and port operations and there is a need for further research on this topic. For instance, how to create a culture that supports increased collaboration between the actors in the port community and a common understanding for the actors about each other's goals and the effect these goals have on the process. Also, it would be interesting to investigate if training in customer focus for the employees working in the port community can be as success as in the Port of Singapore. Additionally, when it comes to unproductive time it needs to be investigated further what is indirectly creating value and what is completely wasteful. For instance, when it comes to the high service degree in Gothenburg some perceive this is very good while others perceive that the level of the service degree is too high today. Increasing or decreasing the level of capacity utilisation when it comes to these resources can have effects on the costs of the port call which has not been investigated in this report. Therefore the capacity utilisation and its effect on the costs also needs further research and we believe that it would be helpful if the *Port of Gothenburg* measure the arrival and departure process to a greater extent. Furthermore, *Supply chain management* in relation to ports where a service is created also need continued focus. It is vital to consider the entire supply chain in the port community in Gothenburg in order to improve together and to avoid sub-optimisations. Due to the time constraints the main focus for the research was on identifying and analysing the problems and there are much more issues to investigate in order to see if the competitiveness could be increased through the proposed suggestions. Hence, since we have done some identifications and proposal for actions, we suggest further research in order to enable implementation and prepare the organisation for the changes. The progress of the implementation of our suggestion and the results need to be evaluated which also is a topic for further research.

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Appendix A – Interview guide

Purpose and intentions of the interview: *Finding out different stakeholders' view on and gaining a deeper understanding of the arrival and departure process for container vessels. Further, the purpose is to investigate if the different stakeholders have any ideas on how increased competitiveness efficiency can be gained in the port call process.*

Introduction: Hey! Thank you for agreeing to meet us and have an interview about your experiences and perspectives on the arrival process. We are doing this study as our master thesis and our final step before our graduation. We decided to do our research at the *Port of Gothenburg* because we find the shipping industry exciting and challenging. Further, it is an industry that has a huge impact on the Swedish industry.

The purpose of our research is to investigate how higher competitiveness can be achieved in the container arrival process at the *Port of Gothenburg* from an organizational perspective. In order to make our result as interesting and useful as possible our aim is to propose a solution interesting for all actors within the port. Because only if everyone is engaged in the solution a real and sustainable change will be possible. Since we come from an outside organisation (Chalmers) and have no prior experience and relationship to any of the actors our goal is to be as objective as possible study the problem with "fresh eyes" and apply our experiences and knowledge of the existing problems.

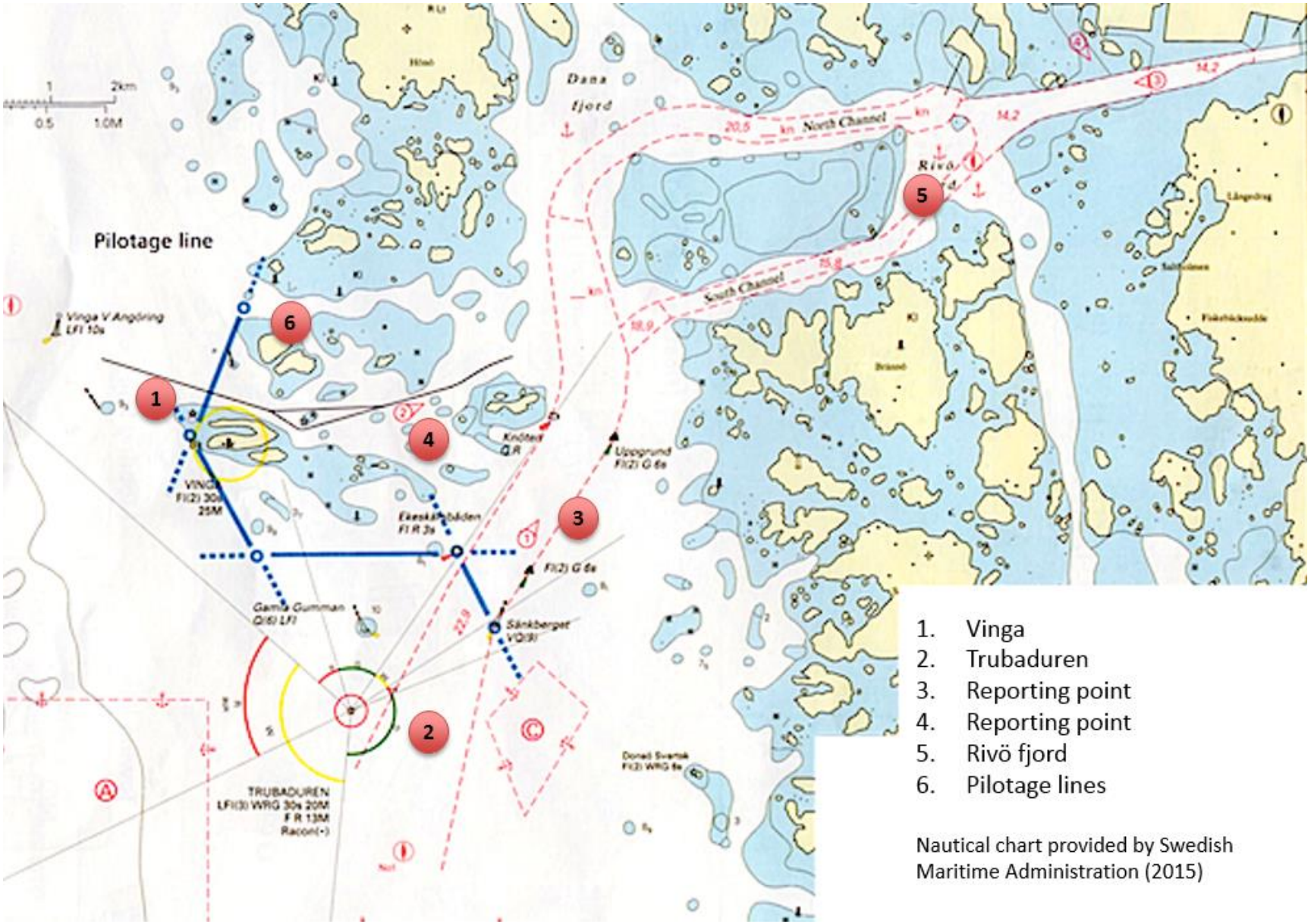
After the interview the result from all interviews will be summarised. The interviews will be handled with confidentiality and we will cover names in the report and it will not be possible to know who said what etc. However, if needed for the understanding the role of the interviewee (type of company e.g. terminal or pilot) will be presented in the result. The interview will probably take around one hour. Further, we would like to record the interview in order so that we can listen to it again later in order to prevent that we forget important information if that is okay. Are you ready to start or do you have any questions before we start? If you have any question during the interview and if anything is unclear, feel free to ask.

Introducing questions:
What is your role at this company? For how long have you been working here?

Subject questions: Focus container calls in Gothenburg
What is your/your company's role in the arrival and departure process?
What is important for you in order to assure that the arrivals and departures will be as smooth and efficient as possible?
Which actors do you interact with during the arrival and departure process?
How do you interact (with other stakeholders) and how much?
What problems often occur during the arrivals and departures?
How do you think these problems could be avoided or minimised?
How can increased efficiency be realised in the arrival process?
From a customer perspective, how do you think the *Port of Gothenburg* could increase the competitiveness?
Is there anything that you would have liked us to ask? Alt. Is there anything of importance that you think that we have missed?
Thank you very much for your participation! Is it Okay if we contact you again if we have any questions?

Extra questions
How can the *Port of Gothenburg* become more attractive as a port choice?
How can the *Port of Gothenburg* gain more customers alternatively increase the volume from already existing customer.

Appendix B – Nautical chart



1. Vinga
2. Trubaduren
3. Reporting point
4. Reporting point
5. Rivö fjord
6. Pilotage lines

Nautical chart provided by Swedish Maritime Administration (2015)

Appendix C – Communication between actors (in text)

Pilot ordering function (POF)
Ship captain and crew (S)
Tugboat captain and crew (TBC)
Linesmen (L)
Terminal Loading and unloading crew (TL)
Vessel Traffic Service (VTS)
Port Control (PC)
Agent (A)
Other Agencies (OA)
Pilot (P)
Shipping company (SC)
Tugboat planning (TBP)
Linesmen planning (LP)
Terminal planning (TP)

Before arrival (24 hours in advance or earlier)

Face to face communication: between PC, VTS and POF.
Radio communication (VHF-radio):
Telephone communication: between A and TP. TP and PC communicates about quay position, ETA, ETD. Between TBP, LP and POF to coordinate resources in scarce situations. Between TP and PC, status updates.
Electronic communication: between VTS and agent. Agent sends electronic information to PC, POF and TBP for preliminary reservation. A reports the ship to VTS and PC. PC approves. TBP send out electronic information about resource allocation a couple of times a day to LP and POF. SC contact with A and TP. A or S reports to OA (such as Swedish customs and the coast guard).

Arrival (five hours before pilotage until at quay)

Face to face communication: between PC, VTS and the POF. Between the S and P (when at sea). Between the S and A (when at quay). LP and L (communication about assignment).
Radio communication (VHF-radio): between VTS, P, S, TBC, L (traffic information). TBC, L, P, S (working station).
Telephone communication: A calls the POF and TBP to confirm order pilots and tugs. POF calls P (allocate work). P usage phones in extraordinary situations. between A and TP. PC and TP (schedule confirmation).
Direct phone communication: VTS calls LP.
Electronic communication: POF sends info about operation to P (via app). A and POF (confirmation pilotage).SC contact with A and TP. POF to P(info about ship conditions via app). POF and VTS info about pilotage times. VTS to PC (ship registration)?. PC contact with sludge, freshwater, SMHI etc. A or S reports to OA (such as Swedish customs and the coast guard). A communicate electronically to TBP regarding ETA and number of tugboats. TBP send electronic info to TBC.

Before departure (change of time and/or scenario actors waiting for departure)

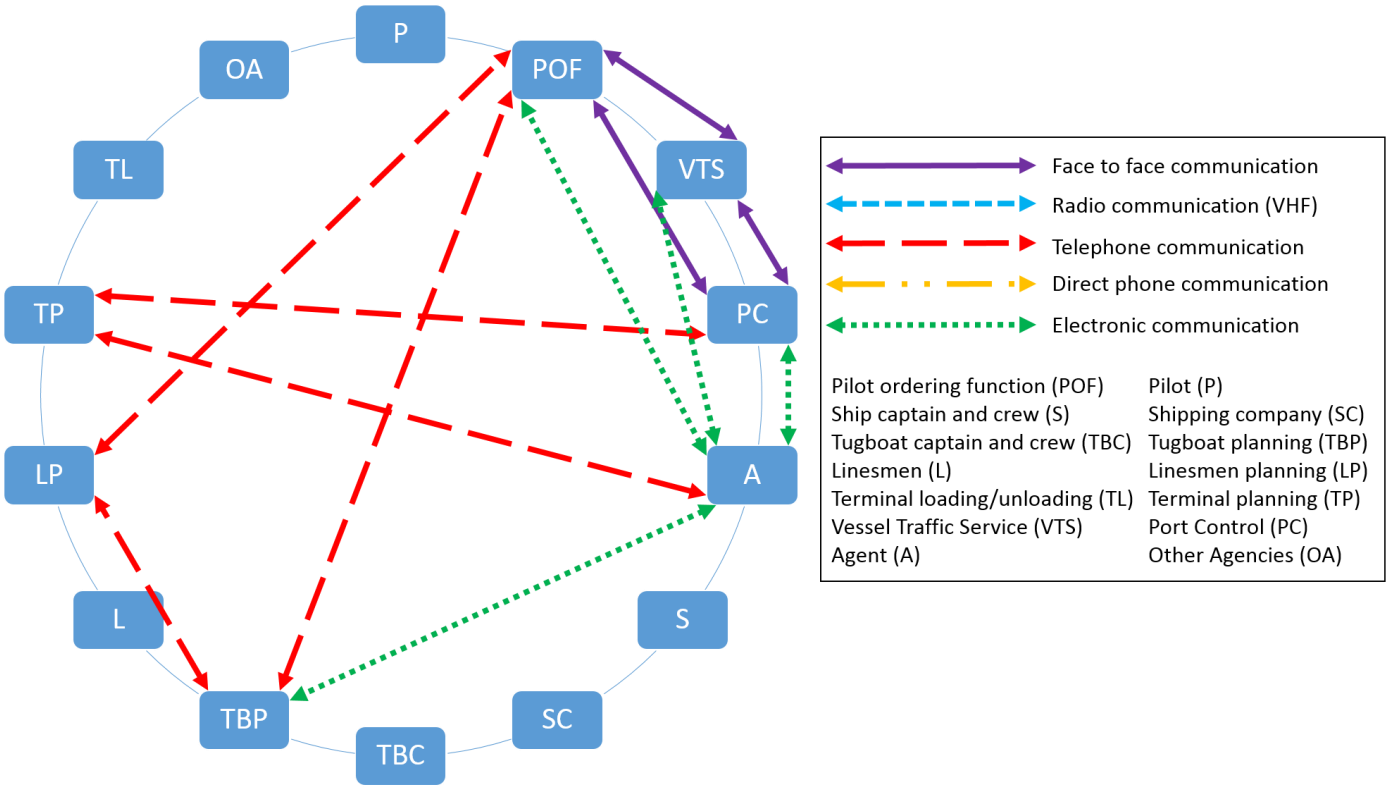
Face to face communication: LP and L (Before leaving). between PC, VTS and the POF. Between P and S. Between the S and the A (when at quay). S communicate with TL. L asks TL how many boxes are left.
Radio communication (VHF): P/S, TBC, L. L communicates how many boxes are left to L, S and TBC.
Telephone communication: between A and TP. A in contact with PC to order departure. PC in contact with A when ETD changes. A calls POF to change pilotage time. TP contacts SC and A in extraordinary situations (containers appearing or disappearing). A call TBP to change ETD, TBP calls TBC. A call terminal to check ETD. TP call SC and A when ETD needs to change. TP calls TL to check status.
Direct phone communication: Between VTS and L.
Electronic communication: A in contact with PC to order departure. SC contact with A and TP. A or S reports to OA (such as Swedish customs and the coast guard). POF communicate info that concerns ship and departure to P.

Departure

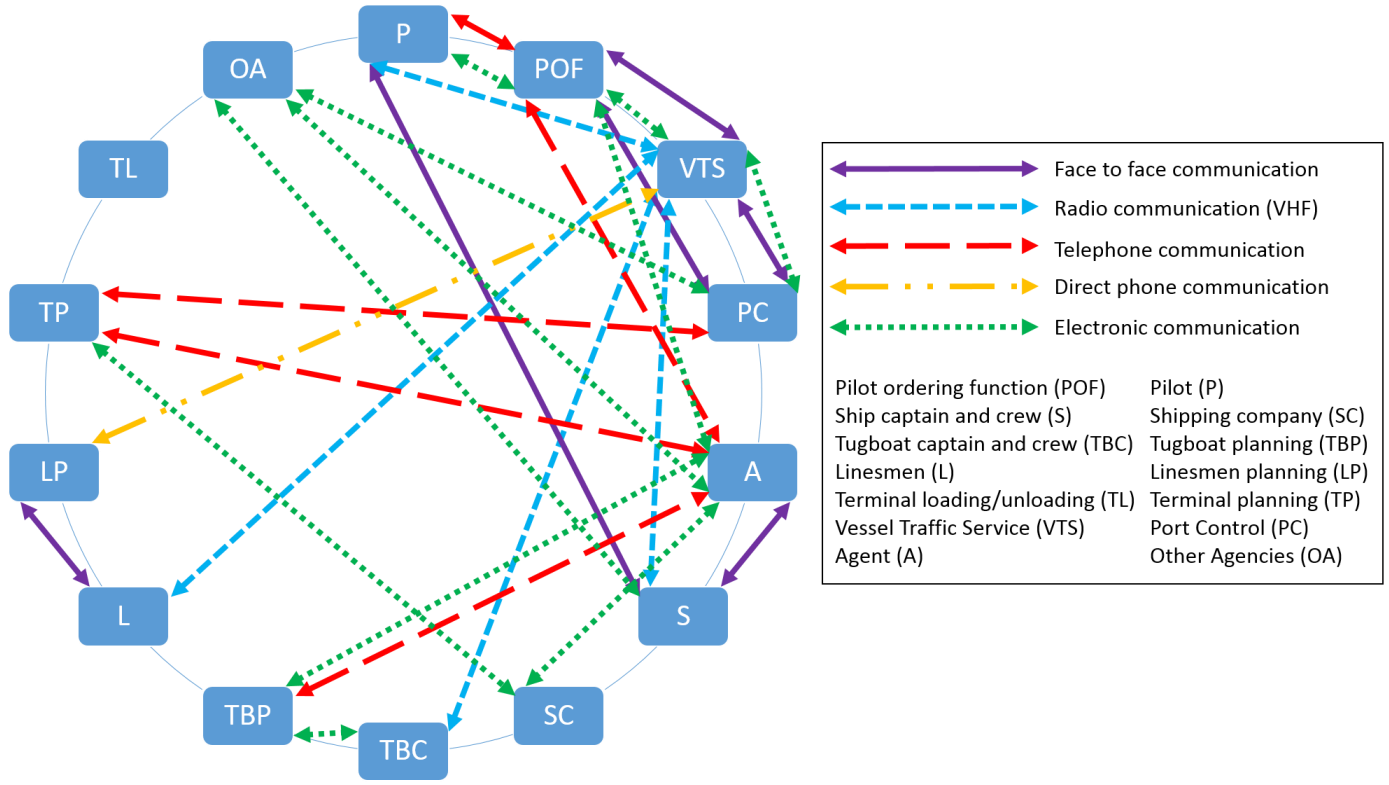
Face to face communication: between PC, VTS and the POF. Between the S and the P (when at sea).
Radio communication (VHF-radio): between VTS, P, S, TBC, L (traffic information). TBC, L, P, S (working station).
Telephone communication: P usage phones in extraordinary situations. between A and TP.
Electronic communication: A or SC sends prospect to TP. TP give response on prospect, back to both A and SC. SC contact with A and TP.

Appendix D – Communication between actors (illustrations)

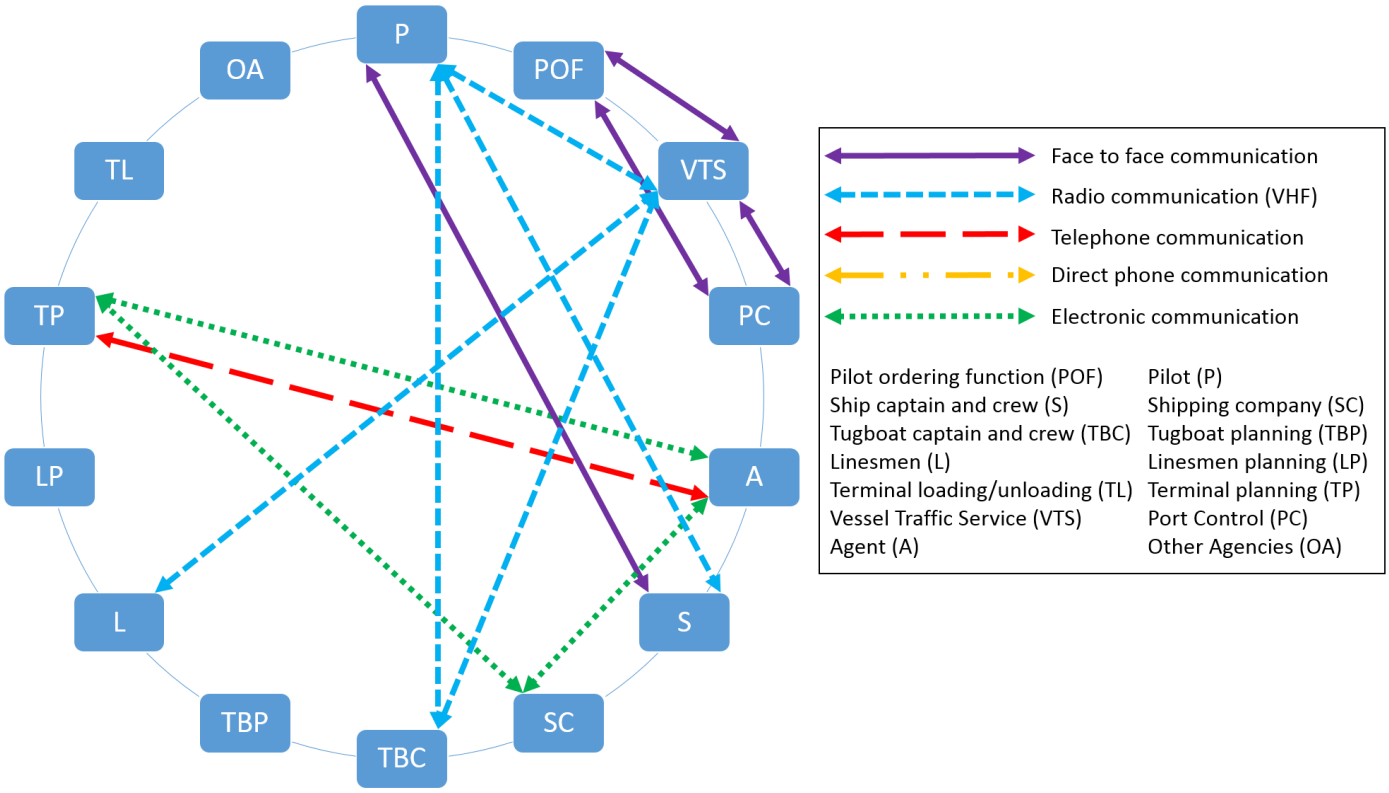
Before arrival (24 hours in advance or earlier)



Arrival (five hours before pilotage until at quay)



Departure


P
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S
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