



Master's degree thesis

LOG950 Logistics

Factors to achieve an efficient port

Case study: Westport AS

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Preface

This master thesis marks the finish line of the master's degree in Logistics, with specialization in Supply Chain Management and Transport at Molde University College. The purpose of this thesis is to illuminate the problem of how ports may be operated in the most efficient way, while highlighting the factors that lead to or contribute to port efficiency.

The study was conducted in spring 2018 by Westport AS as a case study.

The process has been educational and has given me deeper insight into the port industry.

I would like to thank Stig Trygve Andersen in Grieg Logistics AS for helping me during the past six months; for giving me access to material as well as inputs, writing station and the trip to Westport AS. At the same time, I would like to thank for the contact with Westport AS and the informants employed in Westport AS - I would not be able to write the master thesis without your information.

I would also like to thank my supervisor, Odd I. Larsen, for contributing and input during the writing.

In conclusion, I would like to thank my boyfriend, family and friends for contribution and motivation during the thesis.

Summary

The theme of the master thesis is efficiency of ports, and to highlight which factors affect and lead to an efficient port. Based on the theme, two research questions have been prepared:

Which factors affect or lead to an efficient port? and What are the most important factors in port efficiency, considering JIT, LEAN and ETA / ETD?

In other words, the goal is to present the most prominent factors in order to achieve port efficiency.

In order to answer the research questions, a qualitative research with case study and an exploratory design has been prepared. Interviews and an observation have been completed, while theory has been studied in depth. The theory is related to port in general, as well as findings through the case study at Westport AS.

There were several findings that became apparent both through the observation and interviews of Westport AS employees. The factors that is apparent affect or lead to port efficiency, is information sharing, technology, equipment and facilities as well as the human factor.

The theory and findings indicate that the information sharing should be accurate, accessible and constantly flowing, technology should be available, of quality and complexity. As the development of the Smart Terminal System or a similar system, as it proves to be successful for Westport AS. Furthermore, the facilities should be suitable for operations and equipment customized for the volume and size of cargo. Finally, the human factor is a huge resource and should have defined goals, communication, opportunities for development, and clear working hours.

Influencing and contributing to the four factors will also be JIT (just-in-time), LEAN (minimize of waste) and ETA and ETD (estimated time of arrival and departure).

The study highlights just-in-time and minimizing waste as it affects or is affected both in terms of technology, information sharing, facilities, equipment and, not least, the human factor.

Regarding ETA and ETD, it appears that also depends on sharing information, suitable technology, availability and quality of facilities and equipment as well as the employees.

Content

| | | |
|------------|---|-----------|
| 1.0 | Introduction | 1 |
| 1.1 | <i>Background</i> | 1 |
| 1.2 | <i>The problem and the research questions</i> | 1 |
| 1.3 | <i>Limitations</i> | 3 |
| 1.4 | <i>Structure</i> | 4 |
| 2.0 | Case description: Westport AS | 6 |
| 2.1 | <i>Location</i> | 7 |
| 2.2 | <i>The area</i> | 7 |
| 2.3 | <i>Goal</i> | 7 |
| 2.4 | <i>Products and services</i> | 8 |
| 2.5 | <i>Smart logistics</i> | 9 |
| 3.0 | Theory | 10 |
| 3.1 | <i>Port and terminal area</i> | 10 |
| 3.2 | <i>Efficiency</i> | 15 |
| 3.3 | <i>Factors affecting efficiency</i> | 19 |
| 3.4 | <i>The human factor</i> | 23 |
| 4.0 | Methodology | 26 |
| 4.1 | <i>The methodology</i> | 26 |
| 4.2 | <i>Research design</i> | 28 |
| 4.3 | <i>Case study</i> | 29 |
| 4.4 | <i>Data collection</i> | 31 |
| 4.4.1 | <i>Interview</i> | 33 |
| 4.4.2 | <i>Participants</i> | 34 |
| 4.5 | <i>Observation</i> | 34 |
| 5.0 | Quality of research | 35 |
| 5.1 | <i>Reliability</i> | 36 |
| 5.2 | <i>Validity and transferability</i> | 38 |
| 5.3 | <i>Research ethics</i> | 40 |
| 6.0 | Analysis | 43 |
| 6.1 | <i>Port and terminal area</i> | 43 |
| 6.2 | <i>Efficiency</i> | 46 |
| 6.3 | <i>Factors that affect efficiency</i> | 49 |

| | | |
|-------------|---|-----------|
| 6.4 | <i>The human factor</i> | 53 |
| 6.5 | <i>SWOT- analysis</i> | 56 |
| 6.5.1 | Strengths | 57 |
| 6.5.2 | Weaknesses | 59 |
| 6.5.3 | Opportunities | 60 |
| 6.5.4 | Threats | 64 |
| 7.0 | Discussion | 66 |
| 7.1 | <i>Factors leading to efficiency</i> | 66 |
| 7.1.1 | Information sharing | 67 |
| 7.1.2 | IT – Smart Terminal System | 70 |
| 7.1.3 | Equipment and facilities | 71 |
| 7.1.4 | The human factor | 73 |
| 7.2 | <i>The most important factors in port efficiency, considering JIT, LEAN and ETA and ETD</i> | 75 |
| 7.2.1 | JIT and LEAN | 75 |
| 7.2.2 | ETA and ETD | 77 |
| 8.0 | Concluding remarks | 79 |
| 8.1 | <i>Conclusion</i> | 79 |
| 8.2 | <i>Further research</i> | 81 |
| 9.0 | References | 82 |
| 10.0 | Appendix 1 | 86 |
| 11.0 | Appendix 2 | 87 |

1.0 Introduction

This master thesis addresses how to operate port and terminal areas efficient, or how to improve efficiency in ports and terminal areas.

This first part of the thesis describes backgrounds, objectives and definitions. The chapter concludes with a presentation for the structure of the thesis.

*“To know what you know and what you do not know, that is true knowledge”
Konfucius (Wikiquote 2014)*

The above statement highlights the background of the topic in this master thesis – knowing what you know, and knowing what you do not know is real knowledge. In light of the topic, this is important by the reason that if you know how to improve efficient ports, you will take an advantage, and in the other way if you do not know how to operate the port efficient, you will improve it.

1.1 Background

Maritime transport accounts for a large proportion of cargo transported worldwide. For Norway, this is also an absolutely crucial way of transporting cargo, and figures from the fourth quarter of 2017 show that 47.5 million tons of cargo were transported to and from the largest ports in Norway (SSB 2018).

The focus for the master thesis is aimed at the Norwegian coast: Stavanger and Risavika port. Figures from 2017 shows that 639,430 tons of cargo were transported in and out of this port that year. This is not classified as one of the largest ports in Norway, but is appropriate to use in relation to the them of this master thesis (Westport 2018b).

1.2 The problem and the research questions

The interest in logistics and transportation, and especially within the maritime industry, occurred early in the master's program. By doing so, strengthened the

desire and curiosity by deepening within transport. Along with a maritime subject and several subjects aimed at logistics, the foundation formed the theme of this master thesis.

The need to illustrate factors for efficient logistics in ports is absolutely present and appears to be an interesting and educational field.

With this as a basis, the contact with a company that is leading both on ship services, and also maritime logistics; Grieg Logistics AS.

The company offers the customers total logistics solutions, loading and unloading of ships, internal logistics and waste management. They also offer a 24-hour agency support in all major ports in Norway (Logistics 2018).

After exchanging ideas and discussing with the contact person in Grieg Logistics AS, there was a great opportunity to analyze the efficiency of ports.

This is based on the fact that Grieg Logistics AS recently has entered into a partnership with Westport AS. Westport AS aims to be a lighthouse in logistics solutions for maritime transport.

Together, the companies will acquire harbor terminals in Norway, turning them into efficient and profitable ports and terminal areas.

This enables a link between professional interest for the companies and an opportunity to study, where there will be investigated the efficiency of a port and terminal area that operates efficiently today. With this point out specific factors that affect or lead to efficient operation of the port, as well as factors to be improved. Furthermore, the companies, Grieg Logistics AS and Westport AS may focus on appropriate factors founded, and implement or utilize them in specific ports.

The thesis will also include factors such as JIT (just-in-time), LEAN (minimizing waste) and ETA / ETD (estimated time of arrival / departure). The reason is because it is supposed that these are factors decisive in such an efficiency process. Based on this, the following research questions have been prepared:

Research Question 1: What factors affect or lead to an efficient port?

Research Question 2: What are the most important factors in port efficiency, considering JIT, LEAN and ETA / ETD?

The starting point for this master thesis is theoretically anchored. The basis for analysis and discussion emerge through the case study.

The first research question is relatively wide and open, in order to map and explain what factors are pertinent to the efficiency of ports and terminals. In this area, Westport will be studied.

Through the two different methods used in interaction with the employees in the company, it is interesting and appropriate to look if there are any factors that differ in particular and are more efficient than others.

This leads to research question number two, because it is assumed that some factors will be more important than others.

The second research question concerns what is considered to be the most important factors for port and terminal efficiency, taking into account factors such as JIT, LEAN and accuracy of ETA and ETD. These elements are included as they are believed to be of great importance to an efficient port and terminal area.

1.3 Limitations

The master thesis is limited to research on a case study of the company Westport AS.

The result of the master thesis is limited to focus on ports in Norway, how efficiency can be achieved in ports and terminal areas, related to operations.

The master thesis is based on an assumption that factors that contribute to streamline ports will have a positive impact on work, the economy and other prominent factors.

The master thesis is based on literature research on relevant theory in ports and terminals, efficiency and supply chain management.

In addition to this, look into factors related to efficient port operations from the employee's point of view through interviews and observation, as it is assumed that the employees in the port and at the terminal area have a lot of information about how it works, and what to be improved.

By evaluating various practical solutions to factors that contribute to efficient port associated with relevant theory, an overview or possible way to operate a port and the terminal area will be presented.

This master thesis focus on port logistics activities, as this is the greatest potential for streamlining tasks, with the purpose of sharing information, loading and unloading cargo, as well as the human factor in the port. The work has been carried out in cooperation with Grieg logistics AS and Westport AS.

The case study is based on interviews with employees in Westport AS, as well as an observation in the area.

Various factors that contribute to the efficient operation of the port has been analyzed and evaluated. The results and the solutions are so recommended. It is not discussed who will be responsible for the execution or how to perform (order, when, where) but focused on how Westport AS and Grieg Logistics AS may streamline ports and the terminal areas.

The proposals are not complete, but intend as a basis for further research, possibly as a basis for developing or performing best practice. This is only for suggestion on how to start such a process.

It is also important to point out that this thesis only focus on a part of Risavika port and terminal - only Westport's part of Risavika port and terminal areas.

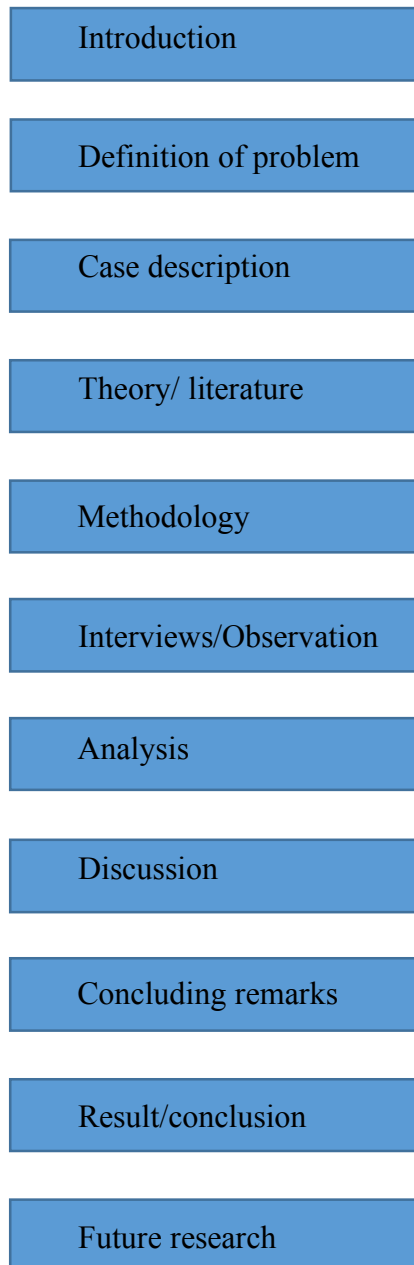
In order to achieve a fully efficient port and to utilize the factors that are found, it requires that all stakeholders in the port and at the terminal area participating.

1.4 Structure

The master thesis origin is formed by the issues. The company Westport AS is presented, and concerns the background for the context. The chapter concerning

methodology forms the basis for literature searches and the theory that will be used. Then interviews and the observation are conducted, and the findings will be analyzed and then discussed against relevant theory. In conclusion, final considerations and results are reviewed.

The figure illustrates an overall structure of the thesis.



2.0 Case description: Westport AS

This part of the master thesis, will describe the framework of the thesis by explaining the chosen company Westport AS (hereafter called Westport).

The contact started with Grieg Logistics AS (hereafter called Grieg Logistics), which has ongoing cooperation with Westport regarding the acquisition of ports and terminals in Norway.

Based on this point of view, both parties, Grieg Logistics and Westport, want insight into and overview of how ports and terminals can operate efficient. The reason for choosing Westport, is due to a developed port and it is operated efficiently as of today. With this in mind, the task is to highlight what is doing efficient and how, as well as focus on improvements. The focus will be on the port, but as Westport offers terminal services, there will be some focus on the terminal as well.

The reason why Grieg Logistics and Westport will look into how ports and terminals can be better streamlined is by the reason that several ports and terminals have to improve the level of efficiency. Thus, it is desirable to develop a base for ports in order to streamline operations.

First, it is briefly explained about the company Grieg Logistics before focusing on Westport, as this company will be the main focus in the thesis.

Grieg Logistics is part of the Grieg Group and has their core business in port systems, strategic services, port security, ship services, offshore base and industrial terminals. Grieg Logistics is headquartered in Bergen and is a key player in logistics and maritime industry. The company focuses on port operations and associated technology solutions. Grieg Logistics is the owner of Grieg Strategic Services, which supplies logistics services, to among others the Armed Forces, which requires high level of professionalism and quality (Logistics 2018).

Westport offers and supplies logistic services for maritime transport, focusing on being efficient, reliable, as well as acquire quality and safety in their operations.

Westport offers, among other things, handling of cargo by containers and bulk, as well as storage of goods inside and outdoors (Westport 2018a).

2.1 Location

Westport is a part of Risavika Havn AS and is located in Tananger, in Sola municipality. The location is not far away from Sola Airport and the freight terminal at Gandal. The location is close to sailing routes in Europe and along the coast of Norway. At the same time, the port is not far from offshore operations in the North Sea and the Norwegian Sea.

The address is: Westport AS, Kontinentalveien 31, 4056 Tananger (Westport 2018a).

2.2 The area

The area consists of concrete paving stones.

Normal capacity is 10 tons of load per square meter. Special areas in the port has a capacity of 70 tons per square meter.

The Westport area is 100.000 square meters and handles 30 -35.000 containers per year. By 2017 Westport handled 639.340 tons of cargo.

The area is secured with camera surveillance and is fenced.

Westport utilizes a total of 6 quays - of which an estimated 40-50 calls per week.

The employees are 25-30 full-time workers in the port and the terminal area. As well as some part-time employees and 1-2 night shift workers (Westport 2018b).

2.3 Goal

Westport aims to "be a lighthouse in logistics solutions, where reliability, quality, efficiency, security, environment, and modern logistics solutions are the best of all we do" (Westport 2018a).

"Through cost-effective shipping, you get more competitive power while choosing a more environmentally friendly way for your goods: the seaway" (Westport 2018a).

2.4 Products and services

In Risavika port and terminal area, Westport offers the following products and services:

- Terminal Services: Deliver services to the customer orders. Utilizes good IT solutions at the Logistics Center, which can control operations in any location.
- Containers: Handle all type of containers. Has efficient facilities for both unloading and loading. All day long, all year.
- Project loads: The port and crane used are very suitable for heavy lifting, over 100 tons.
- General cargo: The employees have extensive experience with all types of cargo.
- Inside storage: Good capacity for indoor storage with or without temperature control. Modern freight handling. Offers also approved customs warehouse.
- Outside storage: Great flexibility. Access to all types of outdoor areas (Westport 2018a).

At the port and terminal area there are the following number of equipment used for handling cargo:

- 3 container trucks of 3-5 tons
 - 1 container truck of 5 tons
 - 1 container truck of 7 tons
 - 2 container trucks of 16 tons
 - 3 terminal tractors
 - 2 container trucks of 45 tons
- (Westport 2018b)



Picture 1: Reachstacker container truck from the visit at Westport

2.5 Smart logistics

Westport focus on smarter logistics, as an extension of innovation that has been central to the development of Risavika port.

The following items are presented as smart logistics at Westport:

- Smart Terminal: A system developed by Westport and tailored to the company's operations. The system has been developed in cooperation with a company called Proximity, where Innovation Norway in Rogaland, also has contributed.

The system operates in real time - and can thus be interfered with both customers and partners' systems.

- Smart Harbor: A software that shares information with all stakeholders in the value chain. From this, companies can achieve a complete overview of freight flow, which leads to better planning and reduced costs.

- Smart Gate: Automated and digital gate control of cargo. This leads to a halving of waiting time for the customers. Digital photographs are also used instead of the inspection of cargo. This has eliminated incorrect requirements. Smart Gate also uses port solution and EDI solutions. This means that the customer operate a lot by themselves, which causes employees in port to spend time on other operations.

- Smart Space: Concerns smarter stacking and handling of containers. This increases the efficiency of handling and stacking. Earlier, the port could handle 30,000 TEU, and when introducing Smart Space it can handle 150,000 TEU. Smart Space increases flexibility, capacity, and enhances their position.

- Green Harbor: Considering a greener port: increasing numbers of ships use LNG (liquid natural gas), and is available in Risavika port. They are in fact the world's largest port for the sale of LNG for shipping and maritime industry.

Shorepower will also be available for calls through Westport in Risavika. This will reduce noise and emissions at the quays.

(Westport 2018a)

3.0 Theory

This chapter will examine relevant theory. The theory aims and will hopefully provide an overview and gain insight on the issues of port and terminal efficiency, factors that lead to efficiency as well as the human factor. The theory is chosen based on the theme of this master thesis and the research questions prepared.

First, the concepts port and terminal will be defined. Secondly, efficiency will be defined and also factors that leads to port and terminal efficiency. In conclusion, the human factors in the port will be highlighted and how they affect efficiency.

3.1 Port and terminal area

Transporting ships and the freight from one port to another is expressed to be the most important feature of the freight system (Chew, Lee, and Tang 2011).

The concepts port and terminal have many definitions, and the following will be highlighted:

A port can be defined as a physical location, which constitutes the interface between land and sea, and aims at and enables the transfer of cargo and people to and from sea transport. The port also enables a connection between the water-based transport solution, its associated cargo and passengers, and logistics, distribution or other modes of transport in the port (Bichou 2009).

The word Port has originated from the Latin language, where it is similar to the word Porta which can be translated to or has the same meaning as Gate (Bichou 2009).

"On the Continent, they regard a port as a gateway for the country's trade, and the wider open the gate, the greater will be the trade gain to the country" - Owen (1914)(Bichou 2009).

A terminal can be defined as the area where various functions such as loading and unloading of cargo are relevant, as well as activities such as storage and stacking of cargo. The mentioned activities are also related to transmission and distribution.

The terminals do not always require separate spaces for different activities, but it is important that the layout of the terminal and, not least, equipment for handling different types of cargo is of high quality and functionality.

This will thus affect the efficiency and flow of activities and operations in the terminal (Bichou 2009).

Stacking and handling of cargo requires the correct equipment, and there are several factors that affect when choosing the correct container handling system. This may be available on shore, necessary density of stacking, costs associated with work, the size of the operation and skilled labour available.

The main tasks or functions of a port and terminal are as follows: loading and unloading of cargoes on and off ships, as well as location and storage of cargo in terminal, and preparations related to the continuation of cargo to other modes, such as trucks.

Port and terminal operations also include value creation activities related to placement, storage, packing of cargo, as well as interaction with other transport types. In order to create an efficient flow, the cargo is sent quickly to the next point in the logistics system (Song and Panayides 2015).

The central port functions therefore consist of physical distribution of cargo, while the responsibility of the total logistics control is at the logistics and distribution centres in the terminal (Song and Panayides 2015).

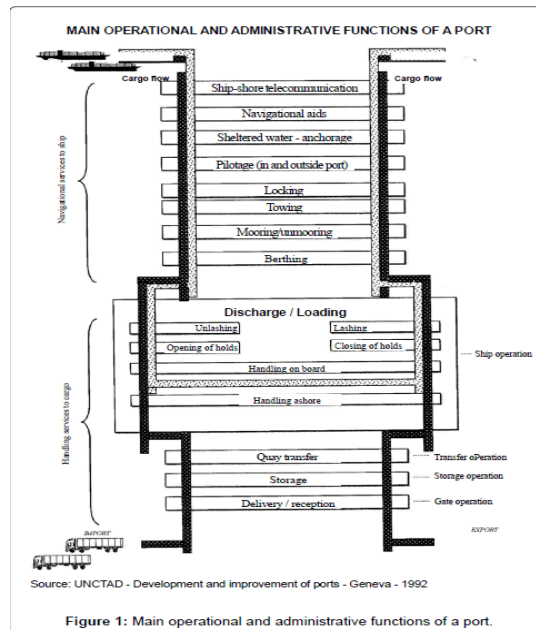


Figure 1: Main operational and administrative functions of a port (Hassanzadeh 2013)

The size of a port may vary from a small quay where ships berth, to large areas, a kind of centre or cluster, linked to many terminals and associated services and industries.

The various ports may look similar in layouts and facilities, but are quite different in functions and roles, as well as assets and operations performed. Even within a specific port, the functions or roles can be relatively different and wide in scope (Bichou 2009).

The main role of ports is to deliver cargo and related services to ships, but traditionally the port's role has been seen as part of, or a subsystem of shipping and maritime industry (Bichou 2009).

| Criterion | Port category |
|----------------------|--|
| Cargo/commodity type | Dry bulk port, liquid bulk port, general cargo port, etc. |
| Ship type | Ferry port, Ro-Ro port, multipurpose port, LNG port, etc. |
| Trade type | Import port, export port, transshipment port, transit port, etc. |
| Institutional model | Landlord port, tool port, service port, etc. |
| Ownership model | Private port, public port, semi-public port, etc. |
| Management model | Trust port, corporatized port, autonomous port, etc. |
| Organisational model | Centralised port, decentralised port, devolved port, etc. |
| Geographical scope | Gateway port, local port, coastal port, inland port, etc. |
| Logistics status | Feeder port, hub port, transshipment port, network port, etc. |

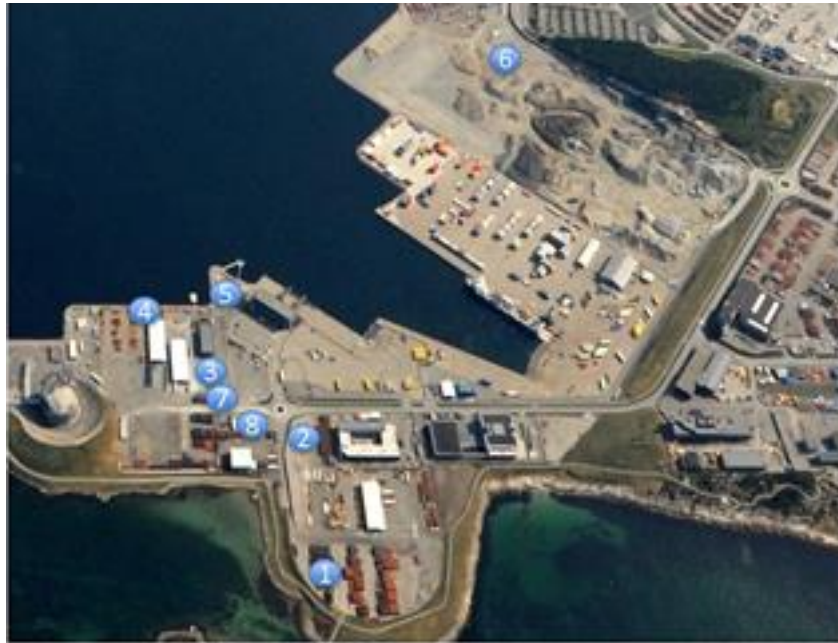
Table 1: Different classifications of ports (Bichou 2009)

There is a classification of ports, Table 1, where port category depends on different criteria. For example, the table classifies typical cargo or commodity type with dry bulk port, liquid bulk port or general cargo port. Depending on the type of ship, it is typical ferry port, Ro-Ro port or LNG port.

Or, if the criterion is logistical status, it is the feeder port, hub port, transshipment port or network port that is highlighted (Bichou 2009).

The typical cargo types handled in ports are containerized cargo, bulk cargo and special cargo (Song and Panayides 2015).

Regarding to an ideal location of the port, Weigend 1958, stated that it should be a deep-water site, that it is easy to enter, it is good and sufficient space to perform necessary operations, a climate that will prevent port operations all year (Chew, Lee, and Tang 2011).



Picture 2: Risavika port – location of Westport (Risavika 2018).

Ports are usually part of a multimodal network, that is, they interact or connect with other modes of transport. This can be, for example, by rail, road or other modes of transport on water. The load unit between the different modes of transport is not necessary identical, where the cargo are not handled in themselves, only transferred from one mode of transport to another. In other words, a form of successive movements (Chew, Lee, and Tang 2011).

More than 80% of the volume of all international trade is by sea transport. This means that the port has a major role in international commerce and trade by the sea. The port is the place where sea transport is connected to other types of transport, i.e. the interface between sea and shore. Furthermore, the port is the location of activities considering trade, logistics and distribution of cargo.

By this, the port has a very important role and assists as a critical resource in the transport of cargo and humans (Bichou 2009).

Costs associated with maritime and trade are positively affected by efficient work in ports and associated operations. Delay, on the other hand, has a negative effect on both logistics and supply chain because it entails costs associated with inventory and storage (Bichou 2009).

The main roles of the authorities in ports are to facilitate logistics services in the chain and the function of developing information and port systems, port optimization, logistics and infrastructure, as well as maintaining a transport system that is efficient and appropriate (Song and Panayides 2015).

3.2 Efficiency

“There can be no economy where there is no efficiency”

Benjamin Disraeli (Wikiquote 2018).

To be efficient can be explained as being effective - to the extent, the intended way and according to the plan (Leksikon 2018a)

In other words, it would be efficient to be practical and appropriate, operate quickly and with a minimum of waste (Webster's College Dictionary 2010).

A definition of efficient is:

"Performing in the best possible manner with the least waste of time and effort; having and using requisite knowledge, skill and industry; competent; capable (Dictionary.com 2010).

Efficiency is to be efficient - in other words, something works according to the plan, that the ratio between effort and return is high, especially in terms of work and capital equipment (Leksikon 2018b).

Definitions of efficiency may be:

"A situation in which a person, company or factory uses resources such as time, materials or labour well, without wasting any" (Cambridge 2018).

"A situation in which a person, system or machine works well and quickly" (Cambridge 2018).

Maritime logistics is a term the maritime transport system is highly integrated and involved into.

A relatively integrated part of the global logistics systems is transport by sea, i.e. maritime transport. A large extent of the services exercised are directly related to the transport, but also other related and associated logistics services. The purpose is to operate in a more efficient and effective manner.

A high degree of operational efficiency has been achieved by the maritime transport, i.e. activities that relate to business and shorter lead time. As well as service efficiency, such as communication, trust, reliability and flexibility, which represents the central value of maritime logistics (Song and Panayides 2015).

Efficiency in ports can be defined by several factors such as the output from number of calls, port operations (such as downtime), time and length of berthing, economies of scale by volume of cargo or port size as well as negative economic factors such as speed of loading and unloading and cargo dwell time in port (Chew, Lee, and Tang 2011).

The efficiency of ports is decisive and a crucial element for shipping costs. This is in view of the ever increasing size of the ships, which increases the waiting time for operations such as cost per waiting hour and services in ports. The waiting time is classified as unproductive (Chew, Lee, and Tang 2011).

Research has been carried about how an efficient operation can be achieved through optimal operation in container ports, and the research suggests that efficiency depends on allocation of ship and facilities. This in view of the fact that berthing, as well as unloading of ships, are a major part of the cause of time spent in ports. In terms of stacking of containers on board and on shore, as well as unnecessary loading in the form of moving containers to find the correct one. In other words, the inefficient work of all the elements around berthing contributes in a negative sense to create an unnecessary loss of productive work (Chew, Lee, and Tang 2011).

There are several elements which make sense in enhancing efficiency in ports, including how operations are managed, correct and updated equipment, updated

and appropriate IT systems, and functional and adapted facilities (Chew, Lee, and Tang 2011).

Efficiency in terminals relies on resources being allocated appropriately at the various stages of operations. Available resources at the terminal can be the bottleneck in the handling process of containers.

In other words, the factors affecting whether a port and terminal area is efficient or not is complex, and the influence or correlation between the various factors can be difficult to determine accurately (Chew, Lee, and Tang 2011).

Ports worldwide are important logistic links between activities in chains of production, distribution, consumption and networks, where the evolving trend has replaced the competition between ports, and the focus is now on logistics chains. This means that ports now prioritize being competitive on logistics chains, more than earlier.

Based on a changing market and increasing competition, the focus is on logistics, transport and port in the industry. Organization effectiveness (OE) is hereby introduced as a new and important concept, and aims to evaluate the success of ports.

The OE will provide an overall assessment of the port organization, as it focuses on both internal and external factors that influence. Thus, it will not only focus on for example, efficiency and productivity (Song and Panayides 2015).

As a result of the change as mentioned, a larger focus on the logistics and supply chain, as well as the increasing competition among those involved in this chain, leads to and affects ports to offer more integrated and specialized as well as value-added services within logistics. This means that ports have to integrate into logistics chains, through sharing knowledge, utilizing information and communication systems, working or collaborating with supply chain operators, increasing availability and implementing intermodal transport solutions (Song and Panayides 2015).

An efficient organization is able to be efficient in operation, and change their goals as a result of changes in circumstances. The authorities in ports also have to follow

the market and define their goals according to requirements in the market. This is as part of the logistics and supply chain (Song and Panayides 2015).

There are 13 measures that describe and explain the efficiency of ports and port organizations in the competitive market. These are as follows:

- Productivity
- Efficiency
- Service Quality
- Profitability
- Growth
- Adaptability
- Information and communication management
- Innovation
- Organizations worth
- Employee satisfaction
- Customer satisfaction
- Resource acquisition
- Integration

(Song and Panayides 2015)



Picture 3: Stacking of containers from the visit at Westport

3.3 Factors affecting efficiency

“Baltazar and Brooks (2007) claim that some minimum level of both efficiency and effectiveness is critical to organizational survival” (Song and Panayides 2015).

“When operating a port or a terminal, individual processes and components (waterside handling, horizontal transport, stacking process, gate control, etc.) have to be in balance so as to achieve overall terminal efficiency” (Bichou 2009).

Due to increasing competition between ports, as well as the change and development of logistics chains, it may be problematic or impossible to assess success in all points in ports. The success factors are growth, profitability and efficiency (Song and Panayides 2015).

There has been and still is ambiguity regarding the definition of efficiency as well as the goals or criteria for efficient goals.

Organizational effectiveness is defined as: "the extent to which an organization as a social system, given certain resources and means, fulfils its objectives without compromising its resources" (Song and Panayides 2015).

Argyris (1964) has linked this definition to his point of view and defined three activities that an efficient organization have as main focus and core activities. These are to achieve the goals the organization has defined, maintain the system within the organization internally, and implement and adapt the organization to the external environment. Thus, four categories have been prepared to analyse and assess OE. The four categories are reaching or achieving goals, having satisfied clients, developing and improving processes internally, and increasing resourcefulness (Song and Panayides 2015).

Organizations should be or are designed to be the most efficient of the social units. Realization of goals determines the degree to which an organization is or acts efficiently. As a result of the lack of knowledge of and exercise of management, there are many ports that lack efficiency, despite the fact that both the infrastructure and the necessary equipment are in their possession.

Notteboom and Winkelmanns (2001) states that if a port and its associated organization are to be successful, in other words efficient, it has to be governed by a market-oriented system to achieve clear goals. First, the goals have to be established, and in this way it will be possible for port organizations to achieve their goals. The port authorities are designated as responsible for the goals, because the efficiency is linked to the entire port, not just part of it (Song and Panayides 2015).

Two important success objectives in ports that focus on logistics are defined by Marlow and Paixao (2003). They emphasize that leanness is necessary to optimize both efficiency and operations. In this way ports will be able to reduce waste, which means do not spend time on non-value-creating activities, and then be able to handle changes in the environment and the port infrastructure (Song and Panayides 2015).

Another view of the success factors for ports from Notteboom (2009), concerning close interaction and coordination between actors for logistics services outside the port and an approach to port facility planning that is integrated in the port. At the same time, it is indicated by Panayides and Song (2009) that a port's performance has a direct link or relationship to the entire supply chain. Panayides and Song states that "there are implications with respect to the relationship between port and terminal integration and port and terminal effectiveness" (Song and Panayides 2015).

Nevertheless, it is pointed out that the port authorities have a major influence on efficiency in ports in logistics chains, in terms of properly planning and thus achieving a flow of cargo that is cost effective. The planning should illuminate a transport flow that reaches beyond the borders of the port (Song and Panayides 2015).

Information and governance management is important, emphasizes Notteboom and Rodrigue (2005), and has stated in this context that "the success of a port depends on its ability to fit into the networks shaping supply chains and indicate that the

availability of powerful information channels are the ability of having knowledge transfer among the parties are the main determinants of success of port networks” (Song and Panayides 2015).

Panayides and Song (2009) also emphasize the importance of information and communication systems. Efficient use of them is one of the most important factors for integrating supply chains in ports (Song and Panayides 2015).

Today's ports operate in an environment that is characterized by many factors: service, interaction and communication with stakeholders, high-level operational complexity, as well as pressures with competitors who are often based on time and deadlines. All of the above factors contributes to create the need for data of large quantities and information to be shared quickly and efficiently between stakeholders in ports and port users (Bichou 2009).

Multiple aids can be used to assist in exchanging and sharing data or other types of information.

One of the aids is ICT systems, Information and Communication Technology, which is a large subject area. The main objective of ICT systems is to communicate, and most often in connection with information and data, for example, to be handled or processed.

Another tool is Terminal Operating Systems (TOS). This system is used in port operations, including prior planning, as a tool in implementation or for control after operations. The system may also be associated with loading or unloading operations, as well as gate or EDI control, which means Electronic Data Interchange, and can contribute to communicating outside the port or with customers. Ports can either buy systems off-the-shelf or be developed by themselves, and the effect can be quite noticeable in terms of achieving the best possible planning, port management and control.

A last mentioned aid is ERP, which means Enterprise Resource Planning, and is a system of collection of programs and where the target is visible information throughout the port and immediate access to real-time information (Bichou 2009).

"From a supply chain perspective, ERP allows a firm's internal system to be integrated within the entire supply chain by providing a platform that allows information flows to be exchanged across the different departments of the company and between the firm and other supply chain members" (Bichou 2009).

The global supply chain has a great contribution to improvements in handling cargo at container terminals. In Maritime Transport, 2009, the most prominent factor for improved performance in ports represents the number of ports with improved crane productivity. The trend of increasing size of the ships has also increased pressure to be further refined in handling operations in terminals (Chew, Lee, and Tang 2011).

Increased output from the crane movements are achieved by many ports, due to better terminal facilities, better training or training programs and new and improved equipment for use in operations.

Several ports have more advanced cranes such as tandem lifts, or four-wheel cranes, but it has not caused a shift in the industry. But this is more relevant in larger ports (Chew, Lee, and Tang 2011).

There are some factors that are highly influence to increase productivity and thus streamline operations between quay and terminal in ports:

- Vessel characteristics
- Vessel scheduling
- Number of cranes
- Yard area, shape and layout
- Yard handling system
- Dwell time
- Number of containers grounded
- Number and sequence of breakdowns
- Labour productivity

(Bichou 2009)

The solution is suggested to use information exchange systems, including TOS. Important elements are drawn to share information about position, automated

handling equipment, techniques for efficient and optimal operation, and other appropriate features that are automated (Bichou 2009).

Finally, this section concludes that port and terminal operators should focus on an overall efficient port and terminal area, and not to single operations.

3.4 The human factor

In the process of improving and developing maritime logistics, there is a potential: the role of the human factor and subsequent interfaces between the human factor and technology. This, and the view of all the different human systems illuminated in the supply chain globally.

As a result of a technology that is constantly evolving and has become more and more complex, it is natural that the distance between technology and the human increases (Song and Panayides 2015).

Human interaction, or human activity in interaction with technology and systems is a science that is defined as ergonomics. Technology or systems are defined as anything from objects, products, and machines (Song and Panayides 2015).

Chapanis (1996) has stated that the goal is to adapt and fit products, systems, general technology and its environment with human abilities both physically and mentally, as well as the human limitations (Song and Panayides 2015).

Karwowski, 2005, range the dimensions of ergonomics from social needs, theory and practice to environment and technology.

The science of ergonomics was founded many years ago, back to 1857 and the founder and researcher was Wojciech Jastrzebowski. Jastrzebowski suggested several aspects of human activity, which included both entertainment, dedication and labour (Song and Panayides 2015).

The definition of ergonomics originates from the ancient Greek language and is divided into ergo, meaning work, and nomos which means law. The definition of ergonomics can be translated into “the science of work” (Song and Panayides 2015).

The International Ergonomics Association (IEA) has a clear definition of the human factor (ergonomics):

"The scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance" (Song and Panayides 2015).

The definition of the IEA is a comprehensive character, as it encompasses all types of human activity: the physical, the cognitive and the organizational activity. Human well-being is included in the definition as a social goal, while system performance at a total level is included as an economic goal.

Grawitch et. Al, 2006, emphasize that the definition is focused on factors surrounding physical and mental health, including motivation, stress, well-being, involvement in organization and morality.

With this, it can be said that ergonomics has a goal and should be an approach to system efficiency in the organization, performance for the organization and human self, productivity and safety, as well as a contribution to the human feeling of well-being and perceived quality of life (Song and Panayides 2015).

It is emphasized that increased knowledge of the principles of ergonomics will probably lead to increased efficiency in operation, increased well-being in the maritime industry, increased productivity and increased quality of service.

By focusing on and considering factors in ergonomics, which are proven to affect the efficiency of the employees, the efficiency at the operational level can be improved. These include factors such as communication, preparation of working hours, processes that lead to increased knowledge, as well as factors at management level (Song and Panayides 2015).

Benefits that affect the organization as a whole include productivity, quality and efficiency, but also minor concerns regarding personnel. These may include factors such as absence, staff volume and potential recruitment, employee turnover, and other obligations related to personnel. For society, improvements related to personnel will help reduce costs related to accidents and health of personnel. Thus,

the maritime transport industry as a whole will contribute to an economic and sustainable system (Song and Panayides 2015).

Investing in human capital includes many factors, some of which may be through training and education for employees, through medical care and diet and vitamins, as well as providing employees with insight into the financial system (Becker 1962).

By focusing on an efficient port, the aspect of human capital has to be focused on as a major contributor to port efficiency. Regarding this, it is important that the employees in the port possess the necessary skills, to at all be able to add and contribute to port efficiency (Thai, Yeo, and Pak 2015).

According to (Gregory and Shanahan 2010) there are several elements, also from human nature, that affect the people in the maritime industry. These are seven items and will be reviewed below.

Through experience, needs, goals and self-control, people are making sense of things. Furthermore, the human takes chances, in terms of, among other things, amount of control and value, and to what extent it is familiar. The third element concerns the human and decisions, in terms of availability of information about alternatives, understanding of the difference between different options, available time, as well as the weighing of efficiency and implementation.

People also make mistakes in this industry, which may be caused by factors such as inadequate safety, communication, staffing, time, training or rest.

People in the maritime industry are also tired and stressed. Fatigue can be caused by several factors such as workload, sleep, perceived risk, diet, fitness and movement as well as the time of day and the environment. Due to the environment, the human can be adversely affected by both light, noise and temperature in its work.

Another important element is learning and development of the human. As a result of employee training, the organization will increase its productivity and increase the efficiency of organizational culture. At the same time, it will affect a reduction in staff problems. The last two elements concerning the human being, both working and communicating with others. The human works both with individuals and in

teams, which can lead to both discussions and negotiating. At the same time through the communication, different perspectives from other employees will emerge (Gregory and Shanahan 2010).

4.0 Methodology

Method can be defined as "how to reach the goal" according to Ulleberg, 2002 (Ulleberg 2002).

This means that the goal the researcher want to reach, largely affects the way the researcher studies (Austrud 2010).

What the researcher actually wants to figure out is important to be reflected in the choice of method (Tjora 2012) (Sagabraaten 2016). Thus it can be said that based on the problem the research questions are prepared and linked to theory at the methodological level.

An important point of describing the method is to explain choices taken during the research, as well as illustrate the impact this has had on the outcome (Holme and Solvang 1996) (Austrud 2010).

Hellevik, 2002, defines method as: "A method is a way of proceeding, a means of solving problems and developing new knowledge"(Hellevik 2002)

This chapter will first present the chosen method, research design and case study. Furthermore, it will address data collection; interview and the participants as well as the observation.

4.1 The methodology

Qualitative method has no clear and general definition, but there is a strict contradiction to quantitative method.

Characterizes of qualitative methods is studied in limited environments. The goal or background is to highlight particularities in each environment studied, as well as to produce a comprehensive approach to processes involved. This is usually made

figuratively. Another characteristic is that the phases or points of the qualitative method can easily be mixed together and clear boundaries disappear.

The focus in qualitative method is aimed at experience, implementation, speech, appearance and development.

The goal of qualitative method is to create or achieve understanding, description, interpretation and an explanation of the human experience (Brinkman 2010) (Krumsvik 2014).

Qualitative method aims to understand social processes that affect thinking, emotion, pattern of action, learning and its development of the human.

This proves and highlights the clear difference from quantitative methodology (Krumsvik 2014).

"Quantitative method is mapping that something happens, while qualitative method reveals why it happens"(Krumsvik 2014).

In this master thesis qualitative method will be used, as it will study and analyze which conditions and factors lead or cause a port to be efficient.

A port has been chosen, which is therefore a limited environment. From this port, it is emphasized to distinguish from what is being studied, the efficiency.

It will build upon understanding and description of conditions as of today, and an interpretation of how and what makes and can make the port more efficient. The focus will be on the social processes, in other words, thinking and feelings, as well as the pattern of what and how processes are done and learning and development associated with this.

The focus will be on experiencing and understanding what is being done in the port, how things are accomplished, how the port is emerging - by interviews. As well as focusing on how to improve operations more efficient.

4.2 Research design

Research design is an overall level plan, which provides an overview of how the implementation of the research should be (Selnes 1999) (Austrud 2010).

When designing a research study, it is expedient and advantageous to map goals and design as early as possible in the process.

From another point of view, research design is said to be a sketch prepared by the researchers, which suggests how the investigations should be implemented (Johannessen, Christoffersen, and Tufte 2011) (Sagabraaten 2016).

Furthermore, when choosing appropriate or correct research design, the most important or most crucial management mechanism is the actual issue (Nyeng 2004) (Sagabraaten 2016). In other words, it is important to develop adequate and appropriate research questions.

The selection and preparation of research questions has a major impact on and is relatively crucial for generating empiricism (Jacobsen 2005) (Sagabraaten 2016). In other words, the choices made affect how it generates empiricism.

The choice of research design for this master thesis is exploratory. This is because the purpose of the thesis and the background for the work are to explore the factors that lead to or may improve an efficient port.

The main feature of exploratory research design is to become familiar and acquire knowledge of the subject. Furthermore, the goal is to deepen within the theme, as well as to get insight both the situation around the theme and the benefits that may be achieved.

Out of this, the subject should be explored and ultimately prepare a suggestion on how and what to be done further (Saunders, Lewis, and Thornhill 2016).

At the same time, deductive approach will be used, where the aim is to shape the qualitative research process and data analysis aspects using existing theory that concerns the subject. In this way, the findings of this research are highlighted against existing theory in the field, and this may result in well-founded ways of efficiency (Saunders, Lewis, and Thornhill 2016).

Regarding the transcription of the findings used in the analysis, there will be noticed during and between the interviews, while after completing interviews, write transcription summaries from each interview that will be used in the analysis section (Saunders, Lewis, and Thornhill 2016).

In this master thesis, the goal is to get acquainted with the issues of efficiency, port, terminal and factors that lead to efficiency. The focus is on the benefits, i.e. the factors that lead to or contribute to the efficiency of the port in the best possible way. And finally, it concludes with a recommendation for how the port can be efficiently operated - how and what port should do to achieve efficiency.

Yin (1994) proposes three points to investigate and map the exploratory research design:

1. What should be explored?
2. What is the purpose?
3. What are the criteria for the exploration to be judged successful?

(Yin 1994) (Lin 2013)

The first question, is answered in research questions 1 and 2, in section 1.2.

The purpose of the exploratory research is to map and define factors that affect and lead to efficient ports.

Regarding criteria for successful exploratory research, it is first and foremost important and appropriate to obtain sufficient information about the subject, as well as the theme. Furthermore, another criterion is to retrieve the correct data and carry out a data analysis (Lin 2013).

4.3 Case study

In this master thesis case study is used. The case study will contribute to highlight efficient factors in this port today. Hopefully, this study will illuminate what may be done to achieve even better efficient operations.

This is in line with the background of the study, which aims to elucidate factors that make ports more efficient.

There are multiple definitions on case studies, and I want to include some of them in this chapter.

Case studies originates from the Latin language and hence the word casus (Andersen 1997). This term can be defined as the individual case and its meaning. Furthermore, case studies are studies of one or a few cases, where the terminology states that the subject is to be immersed (Andersen 1997).

Another definition of case studies is that there are in-depth and demanding studies that involve individual or few studies (Andersen 1997).

Furthermore, case studies can be defined as an empirical study, where several data sources are used, and where a phenomenon does not clearly distinguish between the context and phenomenon (Yin 1994) (Bukve 2016).

Case studies can in other words be defined as a research approach - used in multiple areas - but where there is no common consensus on what refers (Andersen 1997).

What appears to be clear in relation to case studies is that results and conclusions only have a limited value in terms of generalization (Bukve 2016).

In practice, case studies are the results of research processes, not just theories or empirical studies.

“Since the case is whatever we decide it is (..) we can vary the organizational settings we select to explore our research questions and systemically assess and compare the findings (..). (A) case becomes the opportunity to discover knowledge about how it is both specific to and representative of a larger phenomenon” (Vaughan 1992) (Andersen 1997).

There are two features of case studies that separate the experiment and case studies. The first feature is that the case studies phenomena are studied in their real context, and the second feature is that the boundary between the phenomenon and the context is unclear. By experiment, on the other hand, the context is not influenced by the studied phenomenon - and this constitutes the ideal.

Two basic level requirements has been proposed and presented and will contribute to develop the knowledge of case studies. The first requirement is that the case

study has to be structured, as in this context means that standardized and similar questions are asked in different cases (in single case the same question has to be repeated in other studies of the same phenomenon). The second requirement is that the case study has to be focused, which in this context means that the research objective is determined and that focus is directed towards relevant theory for this phenomenon. George and Bennett, 2005, emphasize that it has to be focused in the sense of determining which aspect is most central to the analysis (Andersen 1997) (Bukve 2016).

George and Bennett have made a new contribution to the great literature on case studies: "We define a case as an instance of a class of events" (2005)

With this, researchers consider looking at the case in light of a larger selection or a larger class. The meaning is that theoretical and professional equivalents are linked and analysed against and in light of relevant theory (Bukve 2016).

To achieve a relevant case study, there is a requirement that the researcher has to find a position in the field of research, and further dive into previous theory and empirical research done by other researchers. In this way, the research will contribute a new argument in ongoing discussions around the subject, avoiding producing research only that benefits the researcher (Bukve 2016).

4.4 Data collection

Both primary and secondary data are used to get the most updated and latest information available on the subject.

Primary data is in this thesis information retrieved directly from the port. This through both interviews and the observation.

The theory chapter is based mainly on data already collected, i.e. secondary data.

Primary data is retrieved directly from Westport. The methods used are interviews and an observation, in order to achieve direct information and facts from the employees as well as observe the environment and what appears.

The interviews conducted are not formal in the sense that they are not conducted in a formal situation where the employees are interviewed from start to finish. The

interviews are conducted in a more casual setting, in different rooms at the terminal, as well as out in the port area or in a vehicle.

The questions are written in order, but they are asked in a sequence that suits the conversation and the situation. The questions are asked in a sequence that makes the conversations natural. The purpose of the interviews is to map as much as possible about the theme: what is efficiently operated in the port of today and obtain promotional suggestions to improve the efficiency.

The interviews are conducted in Norwegian because both participants and the interviewer are Norwegian. The response from the interviews is translated in such as the essence of what is expressed appears - and may be perceived as not perfect English.

The combination of observation and interviews is used to gain insight into how operations are done, as well as receive information from the employees. In other words, the combination provides a balanced representation and image of necessary information from the port.

The observation and interviews have been conducted in Risavika port in Sola, spring 2018. The observation has been carried out in its natural environment, i.e. in daily operations.

Secondary data are obtained from relevant literature. For most of the part, it is obtained from electronic databases. The most widely used online search engines are Bibsys, Google Scholar, Oria and ScienceDirect..

At the same time, literature has been used from books, mostly borrowed from the library at Molde University College.

A three-stage process of evolution has been prepared by Machi and McEvoy, 2009. The process has been used to select relevant literature for the thesis.

1. Get an overview of relevant theory - evaluate the titles that can be used
2. Read through theory, both on a general level and more in depth, to choose what to include
3. Relevant theory is mapped and rewritten
(Austrud 2010) (Machi and McEvoy 2009).

4.4.1 Interview

There are several ways to perform a qualitative study, but a widespread way to implement it through the qualitative interview (Krumsvik 2014).

A definition of qualitative interview is: it consists of either face-to-face interviews or via telephone with appropriate participants, or retrieval of data through focus groups that consist of six to eight participants in each interview. Creswell and Clark, 2011, refer to that focus groups have fewer questions than interviews based on views and opinions of employees, as well as the interviews are usually open-ended and unstructured (Krumsvik 2014).

There are several aspects of qualitative research interviews which participates in preparing the framework for the interview and interview session. The purpose of the interview is to acquire knowledge on a qualitative level. There is no interest in or intention to convert text data to quantitative levels. The purpose, however, is to interpret text data in light of its own character, already conducted research in the field and relevant theory.

Through the interviews, is it advisable to write interviewing protocols and make sure that the questions are specific to the extent that the qualitative knowledge sought is achieved (Krumsvik 2014).

For open-ended interviews, three approaches have been developed to obtain qualitative data.

The three approaches are the informal conversational interview, the standardized open-ended interview and the general interview guide approach (semi-structured). The informal conversational interview is almost like a regular conversation, as it is defined as a casual interview. Also called an unstructured interview.

The standardized open-ended interview is a structured interview where interview questions have been formulated in advance of the interviews. Flexibility is limited and the interviewer relates to the order questions are ranked in advance of the interview (Patton 1990).

The semi-structured research interview has as a starting point and interview guide, which is based on the topic as well as planned interview questions. This is the most

common approach in qualitative research (Kvale, 2001) and has an organized sketch of topics and suggestions that can be involved (Krumsvik 2014).

A definition has been prepared by Kvale, 2007:

"Semi-structured (life-world) interview: A planned and flexible interview with the purpose of obtaining descriptions of the life world of the interviewee with respect to the interpretation of the meaning of the described phenomena" (Krumsvik 2014).

With this, Kvale expresses that the focus is on gaining views from the interviewed and descriptions of their lives. Emphasis is placed on the interpretation of the phenomenon, in other words, the phenomenological and hermeneutic framework of interpretation (Krumsvik 2014).

The interview guide used is attached, as Appendix 1.

4.4.2 Participants

When visiting Westport, the interviews and observation were conducted.

Participants in these interviews operate in different departments of the port and the terminal, and are referred to as the following in the analysis chapter:

- One at the contact centre (Employee 1 - E1)
- One at the logistics centre (Employee 2 - E2)
- One working in the port / terminal area (Employee 3 - E3)
- One working in the port / terminal area (Employee 4 - E4)
- One driving a machine that stables containers outside, called reachstacker (Employee 5 - E5)

4.5 Observation

It may be important to observe the context studied, including interaction or behaviour, in addition to the qualitative research interview.

This is another common method of qualitative research, the observation. This method is defined as monitoring in natural situations and at the systematic level of

both behaviour and speaking. If the researcher also has a role in observation, in addition to observing, it is called participatory observation.

The aim and importance of observation results in the disclosure of new knowledge, validation of findings in the interviews, as well as any gap or differences from what the interviewees says being done versus what is actually done in the operations. This is definitely not to "suspect" those interviewed, but in addition because people often may perform differently than thought. In other words, what is said is not always practiced. The observation can be a supplement of information not received through the research interview.

An observation is usually conducted with an observation protocol, which can be defined as "a form used by a qualitative researcher for recording and writing down information while observing"(Krumsvik 2014).

An observation should be carried out in a systematic and defined manner (Krumsvik 2014).

The observation protocol used is attached, as Appendix 2.

5.0 Quality of research

An important part of all studies is to discuss the quality of the study. This includes discussing the quality; whether the knowledge is credible, the strength and how easily it can be transferred to other situations. Concepts used for this are reliability (how reliable it is), validity and generalisability (to what extent it is transferable) (Kvale et al. 2009) (Sagabraaten 2016).

Researchers has discussed whether the terms mentioned above are appropriate to use within a qualitative study, in relation to a quantitative data in which data is actually measurable.

Interpreting or discussing the concepts of reliability, validity and generalisability can be somewhat complicated within the tradition of interpretation (Tjora 2012) (Sagabraaten 2016). Nevertheless, it is still possible to evaluate the collected data in such a way that the researcher is critical of the quality of the data (Jacobsen 2015).

Both validity and reliability are influenced by the choice of research design (Jacobsen 2015).

5.1 Reliability

Reliability is another word for or being reliable. The term also refers to words like consistency and replication (Saunders, Lewis, and Thornhill 2016). By replication, as if another researcher achieves same results or findings through replicate previous studies, the studies will be defined as reliable.

Reliability can be threatened or affected in several ways in a research process (Näslund 2002).

A definition by Kvale, 2007, of reliability is:

"Reliability: Pertains to the consistency and trustworthiness of a research account; intra- and inter-subjective reliability refers to whether a finding can be replicated at other times and by other researchers using the same method "(Krumsvik 2014).

Kvale, 1997, emphasizes that in a quantitative study, reliability relies on validity, but it is not that easy in a qualitative study. Emphasizing transparency in a qualitative study will contribute to highlight what has been accomplished in the study without being the direct definition of verifiable (Krumsvik 2014).

There is a distinction between internal and external reliability.

Internal reliability is directly linked to the consistency, guaranteeing the consistency of the research. Consistency can be achieved by involving more than one researcher in the research project, with regard to interview and observation, and that the parties can analyse and discuss the findings against each other and eventually agree (Krumsvik 2014) (Saunders, Lewis, and Thornhill 2016)

External reliability relates directly to verifiability. The assessment of external reliability depends on the researcher's techniques for collecting data and in the next step analysing them in the way that it is possible to use in other settings or by other researchers (Krumsvik 2014) (Saunders, Lewis, and Thornhill 2016).

Reliability can also be defined as:

“If a later investigator followed exactly the same procedures as described by an earlier investigator should arrive at the same findings and conclusions” (Yin 1994).

In this master thesis there is one researcher. Techniques for data collection, as well as data analysis follow methods developed by researchers.

Four threats to reliability are defined:

The first is a participant error, which can be related to factors that may affect how the participant performs. An example of this might be to ask participants at sensitive times, just before lunch break. In this master thesis, the interviews were adapted in appropriate times for the participants and the times varied from early in the day to after the lunch break. None of the participants were hasty or had other issues in relation to the interview time or other disturbing factors.

The other threat is participant bias, which can be related to a factor making the response untrue. An example of a factor that might lead to an erroneous response may be an interview conducted in an open landscape, in fear that others will overhear the response. Then, the participant may respond differently than if it was conducted in a locked room. The participants may be afraid to say the truth, and for example, they might think it will affect their jobs. The interviews were conducted both outside and inside at the port and terminal area. The interviews were implemented with one at a time, and were conducted without any other listeners. Sometimes other employees passed, but none of them stopped and listened. In this way, the impression was that the participants were honest and told their experiences and at the same time mentioned factors that can be done differently or better.

No names are repeated in the thesis, and the information from the employees is repeated with codes as explained in section 4.6 - participants. This is supposed to have an impact on honesty and the response. The experience was a high degree of participation and openness.

The third threat is researcher error, which can be related to factors that may affect the researcher's interpretation of what is being informed. This can be factors directly related to the researcher, such as unprepared, tired or misunderstandings. In this master thesis, the interviews were conducted on a well prepared day from

the researcher point of view. There were no factors directly related to the researcher that had a negative impact. What was asked for or informed to the participants seemed to be understood because as the researcher received long and elaborate answers and responses.

The last threat to the reliability of the study is the bias of researchers. This is linked directly to the registration of responses from the participants and if there are any disturbances associated with this. For example, the researcher leaves his or her own opinion on the subject or interpreting influence. The research has been as subjective as possible, and has not influenced the notes from the interviews (Saunders, Lewis, and Thornhill 2016).

As for secondary data, information from the company's website has been used, as well as literature from reliable databases recommended by the school.

5.2 Validity and transferability

Validity is defined by Hammersley, 1987, as:

"An account is valid or true if it accurately represents the features of the phenomena, that it is intended to describe, explain or theorise" (Krumsvik 2014).

In qualitative research, validity is in other words whether the researcher has investigated the purpose intended to investigate. The methods used is supposed to achieve research findings and at the same time minimize threats to validity (Näslund 2002) (Krumsvik 2014).

Concepts used in relation to validity and amplify the definition are trustworthiness, verifiable and transferability (Krumsvik 2014).

There is a distinction between internal and external validity.

Internal validity is simply a relationship between two variables (Saunders, Lewis, and Thornhill 2016). In other words, it can be defined as consistency between theory and the researcher's findings. Credibility is also a term used in conjunction with internal validity.

Invalidity occurs if the results from the research are inaccurate or incorrect. If invalidity occurs, it will also affect reliability, because then it is unlikely that a

subsequent study on the same subject will achieve the same erroneous results (Krumsvik 2014) (Saunders, Lewis, and Thornhill 2016).

The most frequent threats to validity are:

The first is past or recent events, which can be associated with the participants' views changing due to an event, whether it's a positive or negative event. In this master thesis there are no known events that affect or influence the participants' views on the topic.

Next, is testing which may be related to threatening the participants' view or action. As the response from the interviews may be weakened, by the reason that the participants not expresses their opinion in fair of any consequences in the future. The experience was that the participants were not afraid to express their opinion or any consequences. The theme of the thesis will be associated with development and improvement, and the idea is that the participants expressed their opinion to contribute to future development.

Furthermore, instrumentation is considered as a threat. By this is meant the change of an instrument in the research which thus affects the result. In this master thesis there is no known change of instrument (Saunders, Lewis, and Thornhill 2016).

Next is mortality, which relates to participants who leave their job or withdraw from the study. In this master thesis this did not occur.

Maturation is the next threat and relates to the influence of participants' attitudes and behaviours, which are beyond the study, as courses or training. The visit in the port lasted for one day and no other opinions or attitudes to the subject after the interviews is received.

The last is ambiguity about causal direction, which in other words means lack of clarity and information about the cause and effect. In this thesis, interviews discussed the effects of improvements, and which improvements lead to what effects. At the same time already achieved effects of, for example, the preparation and introduction of a new system (Saunders, Lewis, and Thornhill 2016).

External validity is strongly linked to the term transferability and concerns the extent to which findings can be generalized across social settings. In other words, if

findings from a study can be relegated to other situations. To what extent can the findings be generalized? (Krumsvik 2014)

The transferability of one study to another can be judged by several factors: the questions prepared by the research, the design of the study, the context, the findings in the study and eventually the interpretation (Saunders, Lewis, and Thornhill 2016).

The findings in this master thesis are therefore linked to the above factors in order to assess whether they are transferable to another setting.

A factor that may become appreciable is for more generalization, other ports could have been studied, for example conducted surveys or interviews in other ports in Norway. In this way, to investigate if the findings were fairly similar, and may be generalizable. Due to lack of time, this is not done in this master thesis, but can be used as a basis for further research.

The findings in this thesis are meaningful and credible, to the extent that it is reliable.

In order to build credibility and highlight the opinion of the participants, the choice of interview was appropriate, as well as substantiate the interviews with questions to follow-up, so that the essence emerged.

As a part of the goal of the thesis, is to generalize the findings, such as other ports may benefit from the findings.

The case is described in detail, and other ports may benefit from the findings.

In summary, it is initially important to discuss the reliability and the internal validity of a research project. This because there is no purpose to generalize information that is meaningless (Krumsvik 2014).

5.3 Research ethics

Research ethics can generally be defined as an assessment of norms and values in relation to research. The assessment concerns both the problem and the method used by the research, as well as the application of the results of the research (Krumsvik 2014).

Furthermore, it is expressed by Silverman, 2011: That because "(...) qualitative research inevitably involves contact with human subjects in the field, ethical problems are not usually far away" (Krumsvik 2014).

This is intended to emphasize when researching a qualitative level, ethical awareness has to be developed. In other words the human moral habitus (Krumsvik 2014).

According to Norwegian dictionary (Skoie, 2009), the difference between ethics and morality is as follows:

Moral - Relates to the good and the correct, what is allowed and which has to be rejected.

Ethics - Reflection on own and others' morals. Also called the "theory of morale". In other words, the research ethics can be said to be part of all the stages of research, and therefore the importance of high awareness of ethics in all stages. This is an important part of qualitative research and may be in terms of laws, privacy, sensitive topics and behaviour towards the participants (Krumsvik 2014).

In this master thesis it was informed in advance whether interviews and observation would be conducted.

By informing the participants in advance about the subject's theme and purpose, as well as the main features of the design, informed consent has been obtained (Kvale and Brinkmann 2015) (Sagabraaten 2016).

Furthermore, the participants in the interviews are anonymized by the reason that the participants should be able to talk freely through the interviews.

Upon completion of the master thesis, the material obtained through the interviews and the observation will be deleted.

The importance of the participants not being injured as a result of questions asked, in the form of sensitive topics, is highlighted (Tjora 2012) (Sagabraaten 2016).

The theme and questions in the interviews are not of an emotional nature.

When reflecting on qualitative research and its consequences, it is an area of uncertainty that opens and is complex and unpredictable (Kvale and Brinkmann 2015).

Thus, it is important to be aware of their behaviour and questions posed. At the same time aware that it is the researchers responsibility that the participants expresses and character is not presented in a bad manner (Tjora 2012).

6.0 Analysis

In this chapter, findings from the interviews and the observation will be linked to theoretical aspects, which is presented in different approaches based on the research questions.

The first part of the analysis concerns primarily port and terminal. The second part efficiency and section 6.3 factors affecting efficiency in port and terminal.

Section 6.4 presents findings and reflections concerning the human factor in the port, and finally section 6.5 concerns the most appropriate factors due to efficiency linked to LEAN, JIT and ETA and ETD.

All factors and subjects are linked to findings from the interviews and the observation.

The categorization of this section is done to distinguish the different factors and their underlying powers or impulses.

Thus, the presentation of the findings and reflections of each factor can be transferred directly to the section for discussion, chapter 7.

All factors will elucidate both research questions.

6.1 Port and terminal area

The theoretical chapter, chapter 3, presented a definition of port and terminal and the definitions characteristics, as well as the main tasks of a port and terminal area. At the same time, as it is defined as the main operations or characteristics of an ideal location for a port.

In order to clarify the views and opinions by the employees on the factors above, the second, seventh and eighth questions from the interview guide are presented. These concern how the port and terminal area operate, the different operations and physical conditions.

The employees expressed how the port and terminal are operated, their main operations, machines and cranes used, as well as other relevant information for the thesis.

The question concerning how the terminal and port operates as of today, the following were prominent:

"For container goods, which are a lot of the cargo in the port, a system called Smart Terminal System is used, where information is automatically shared between the persons involved. The system operates such as when trucks enter the terminal area, through a gate, the trucks arrival is registered. The same procedure is done when trucks leave the area. The trucks are equipped with an iPad, to be able to book time in the port advance of the arrival. This way the employees in the port and terminal area have an approximately number of how many trucks arriving in a day. The registration in the port and the booking is done by the truck's license plate " (E1).

"The Smart Terminal System is developed by and for Westport, and provides information by the gate at the entrance and exit of the port and terminal area. The system also provides other data, for example, expected time of arrival for a ship - as well as updated information about when the ship actually arrived and departed the port. In addition, information about the responsible employee for each call, as well as trucks in the area. The system is linked to a billing system and a system for customs clearance. There are also recorded temperature controls on cargo and information about cargo defined as dangerous" (E2).

"Smart Terminal System was a good investment" (E3).

The respond to how the port operates, the employees highlighted that most of the operations are done through the Smart Terminal System.

The system collects and provides a lot of information and constantly updates the employees involved in the port and terminal.

During the observation, there were noticed screens around the terminal building displaying information from the Smart Terminal System. This is information about which trucks are in the port at the current time, the responsible employees for the different calls during the day, weather forecast and camera surveillance of quays. In this way, the employees receive updated information at any time, no matter their location in the terminal building.

Four employees are working at the Logistics Center, which operates mostly in the Smart Terminal System. Three of them have background in operation in ports, and thus have good experience and assumptions about how operations should be planned and implemented.

Most of the remaining employees are working in the port and terminal area. In the port area, the main tasks are to load on and off ships, load trucks, stack and store cargo, stack containers in system, ensure that the stored cargo holds the correct temperature, responsibility for different calls and registration of dangerous cargo.

"As of today it is a well-organized port and terminal area. The quays are located tight and close, which means short distances from quay area to location for stacking and storing containers. For the current volume of cargo, the conditions are well organized.

The physical environment is also suitable, there are no special challenges in the physical location" (E2).

From the observation, it seems that the port and terminal area is suitable for the operations. A part of the observation took place as car passenger in the area. One of the employees (E4) explains the use of and parts of the area.

"The port area consists of 6 quays. They are located relatively tight and close to each other. The containers are placed and stacked in an area adjacent to the quays and the port. The cargo to be stored are placed in 3 different halls, and are stored for a couple of days and up to several weeks. These include cargo such as sugar or proteins requiring certain temperature for the durability" (E4).

At the same time, the employee (E4) explains the outdoor areas where stones and slate are stored for customers.

During this trip the gate which trucks drive through and register in and out of the port and terminal area were observed as well.

The cargo carried out through the gate are photographed for documentation of the condition.

"By photographing the container or cargo before leaving the area, the number of claims have been reduced as we are responsible for the condition of the cargo when departure the port. The photos have a high degree of details, which leads to control of the condition of the cargo. Costs associated with claims are reduced, because in the past we used much time to handle claims" (E1).

6.2 Efficiency

The definition of efficiency and the factors that may lead to or affect port efficiency, as well as port efficiency measures were presented in the theory chapter. Among other things, equipment, IT and facilities in the port and terminal area were identified as factors that affect or lead to port efficiency.

The first thing that emerges during the interviews regarding to efficiency is:

"Information sharing is alpha and omega for an efficient operation" (E1).

Furthermore, efficient operations in the port today are expressed to be:

"A lot of the work or operations carried out daily is done efficiently. Sharing of knowledge and information contributes to efficient work, which means that the information sharing can be done efficiently" (E5).

"The Smart Terminal System contributes to efficiency, because it constantly provides updated information and a high degree of necessary details" (E2).

"The gate used by the Smart Terminal System, which trucks drive through in order to document the cargo, has contributed to reduce the number of claims, thus saving time and in this way working more efficiently" (E1).

"At every call, the employees operate efficient. The customers are not interested in paying more than necessary for the operations, and even regard to overtime" (E1).

"The technology makes the port efficient. The necessary information is in the system, for example, when containers arrive the port we already have the necessary

information. This is more efficient than paperwork. As well as the pre meetings with the flagman and the mate onboard the ship each morning, in order to plan the day and thus avoid chaos and unnecessary use of time during the day" (E3).

"We are also constantly concerned to optimize the number of crew in relation to expected calls during the day. Each day starts with a plan - which would have been optimal to follow. But the day changes, and regarding too many employees at work in some cases leads to some returning home or, in some situations, too short staffing which leads to preparing a new work plan and recalling of employees" (E1).

The next question during the interviews regarding efficiency, concerns the opposite - operations not efficient implemented.

"General cargo, i.e. cargo not shipped in containers, are probably the less efficient factor in the port. The reason is because these types of cargo require paperwork. The trucks have to bring their booking number for the operations in the port for approval at the contact center. If the booking number is not carried, a third party has to be involved to confirm the cargo to be retrieved. This may create a queue in the port due to, for example, waiting time to obtain third parties" (E1).

"Challenges in the operations? First of all, the cargo not fitted by the Smart Terminal System. This type of cargo requires paperwork and does have the same documentation of the condition, as for container goods. For this kind of cargo manually pictures are taken. The challenge is that the pictures for documentation are not sufficient enough, in terms of less details. This is a less efficient way of operating" (E3).

"Another element that leads to less efficient work, is cargo which does not withstand water or precipitation. These are for example sugar, gluten or protein. As we are relatively exposed to poor weather and rainfall in Risavika, an operation of cargo consisting of sugar, gluten or protein may last for a long time. An example a few weeks ago, where an operation which would last about 12 hours, we spent 3 days due to that type of cargo and the weather conditions" (E3).

The last question about efficiency consider if there are specific suggestions for further efficiency in the port, the following factors emerged by the employees. The employees mentioned, as assumed, both factors consider information sharing, IT-systems and equipment, which also emerged by the theory as factors affecting the efficiency.

"In my opinion, efficiency improvement suggestions are to utilize the human resource correctly. This means having motivated employees that feels ownership will create value. The motivated employees will probably operate in the right time and at an expected pace. A development of the Smart Terminal System for general cargo as well, not only container goods, which will contribute to remove the paperwork. And finally, further information sharing at all stages in the port and terminal area. The information sharing leads to an everlasting flow, which may result to a successful business" (E1).

"The efficiency improvement suggestions in the port and terminal area, are developing a more automated billing system, as well as a more automated customs clearance system. Furthermore, more advanced cranes, which are partly independent of human operations. These handles more containers at a time and are used in several other ports in the world" (E2).

"Suggestions to achieve even more efficient operations in this port, I think are the following factors:

First of all, that we always have necessary information about the actual cargo. Maybe we should have a list for cargo to be loaded and unloaded at each call, because it will often be time consuming to locate the correct container during the call. This could have been done in advance of the call. Furthermore, I suppose it would be more efficient by using robots or drones. The challenge by this, is that robots and drones require standardized ships and cargo.

More advanced cranes and equipment, such as ATG- cranes or STS are also a factor contributing to be more efficient. This will be a huge investment cost, but in addition the cranes may then be able to communicate or interact with the Smart Terminal System" (E3).

"I would also like to add that the screens displaying updated information in the port and terminal makes the port operate efficient. The reason is it may contribute the employees to receive updated information between one operation to another, instead of logging on to a computer and then receive the necessary information" (E5).

6.3 Factors that affect efficiency

This section addresses several questions from the interview guide, as there are many factors that affect or lead to an efficient operation. The theory concerning efficiency mentioned some of the factors.

The questions posed from the interview guide in this context are number 15 to 21, 24 and 25.

These questions concern the information flow, the extent to which digital tools are used, the working culture in terms of reaching planned hours, the value chain and downtime, as well as the challenges the employees encounter during the operations.

From the observation in the port and terminal area, the operations during the day, were perceived like their daily work. The operations are done both as routine work, but other operations also suddenly appears and has to be carried there and then. The employees seem to communicate well with each other and the atmosphere seems to be positive. The impression is that all employees have their responsibilities and operations under control.

The human interaction between the employees in this port seem to improve the work to be efficient and may lead to increased workload. This theme will be highlighted in the next section regarding the human factor in the port.

Regarding the question concerning how the information flow is in the port and terminal area, the feedback is already received, due to both question of what is done efficient in the port today, as well as in the forthcoming section regarding strengths in the SWOT-analysis. The information flow is expressed to be good, both because the use of Smart Terminal System, and also due to the availability of information in the port and terminal area.

Suggestions for more efficiency, appear to be further information sharing at all stages in the port. This means and lead to that all employees involved has the correct information and as accurate as possible.

"The Smart Terminal System contains and shares information, including when ships are supposed to arrive in the port, as well as updated information when the ship actually arrived and departed the port (ETA and ETD). As well as information about the responsible employee for each call, the different trucks arrive and departure the terminal area, measured temperature control on cargo, customs clearance, invoicing, TEU and tonnage" (E2).

Regarding suggestions for further efficiency, it is mentioned that both the Smart Terminal System have to be further developed and that the employees have the appropriate tools and equipment to perform the operations. Furthermore, that there are good practices and cooperation and atmosphere in the area, as well as each and every employee's performances are noticed. This means recognizing performed operations and keep in mind that there are people who complete the operations, not only machines. This is an important factor for achieving success, as the human is a significant resource in operations.

Furthermore, improvements for more efficient work in the port were asked for. The employees perform the operations and they may be physically heavy sometimes. Thus, it may be assumed that a lot of the performances by the employees will affect the efficiency of the operation. Of course, factors as mentioned, such as access to the equipment, facilities and technology also may affect. However, the use of these auxiliaries will determine how efficient the employees perform.

From the observation, there were not noticed any waste of time by the employees. There are often operations to be done and each employee is performing whether it is at the logistics center, in the contact center, or in the port stacking and placing cargo.

It seems like the operations are done quickly with quality in work.

“Each call is done efficient. There has been a noticeable change in relation to overtime by the customer. This has affected or lead to carry out as much as possible through the normal working hours, and the remaining operations has to wait until the next day" (E1).

"All employees use the technology available in the port, which lead to efficiency. We share the information about the various ships, trucks and cargo, as well as updating information when necessary.

Starting the day with a meeting, with both the flagman and the mate onboard the ship also leads to efficiency. In this way, the day has a structure, which is believed to lead to more efficient work" (E3).

Furthermore, the question concerning digital tools used in operation in the port and terminal area is already answered, as well as noticed during the observation. Several parts of the operations are dependent on digital tools. As mentioned earlier, the port and terminal use the Smart Terminal System.

Smart Terminal System is used in several of the operations, both in relation to ships and trucks. The trucks are also equipped with iPads to be able to book time or notify their arrival, in advance of the arrival in the port.

The employees in the port use walkie-talkies to communicate.

There are also screens, as mentioned, making the information from the Smart Terminal System visible and available several places in the port. This port may be classified as digitized.

The only factor perceived during the observation which is not digitized, is the registration of general cargo by the gate. For this type of cargo, as previously mentioned, paper is used. This involves paperwork for the employees. As well as, the condition of the cargo is not documented by detailed photos. The documentation by photo is used for container goods and has previously been mentioned by the employees as streamlining. The reason is because of reduced time due to fewer claims.

The employees suggest a digitized version for general cargo as well. This has to be developed, and may be an opportunity through the Smart Terminal System.

The twentieth question from the interview guide concerns being precise or reaching planned hours. Another term that concerns the same, is just-in-time (JIT).

From the observation the employees seem to always be precise and then be just-in-time. At the same time the employees are present when needed, in the way to be prepared when trucks arrive and ready to unload and load containers when ships arrive. The employees seem to consider avoiding the customer to wait. To be present and just-in-time are success factors in this port, as well as other ports. As previously mentioned, operations are efficient at each call. This is also likely to be affected by two factors: the employees will finish their jobs, as well as avoiding waiting time in port, in terms of customers to be satisfied with the service and time spent in the port.

Regarding the question concerning downtime in the port, the following answers emerged.

"Downtime? Not often. If any equipment is out of service, it may take several hours before repaired. If the weather is bad, it may lead to downtime such as a wind speed of 27 m / s or stronger, lead the port to be closed. The location is weathered, and strong wind often causes ships struggle to add the port" (E3).

"Monday, Tuesday, Friday, and the weekends are often busy. At Wednesday and Thursday it is usually less operations or ships and trucks in the port and terminal area, in other words less work" (E3).

The last question linked to factors affecting efficiency, is in relation to the challenges the employees encounter during the working day.

As understood, there are few challenges in the port, as this port is an organized and well-functioning area.

"One of the things that may be challenging is to figure out how to handle "difficult" cargo. For example, cargo in unusual sizes or shapes are considered difficult goods, which makes it difficult to determine which machines or equipment to use.

Furthermore, it is challenging if machines break down. If we experience a difficult situation, we attempt to find the best possible solution" (E4).

"The weather may be challenging, but unfortunately not to be controlled. We need to accept the weather as it is, and find the best possible solution in different situations.

Another element is cargo that not withstand water or precipitation, which also challenge us because it may require a lot of time to handle.

And another element to mention, the general cargo is not to be photographed by the gate. It will be more efficient if the Smart Terminal System is compiled for general cargo as for the containers" (E3).

6.4 The human factor

The human factor is important and concerns whether the employees feel ownership of their jobs. As mentioned above, the interpretation of the environment and atmosphere in the port and the terminal area is positive. From the observation, visiting the various parts of the port, including the contact center, the logistics center, and other areas, indicates committed employees.

When talking to the different employees, it seems that they are proud to work at Westport, as well as during the trip in the area.

The environment seems to be positive, as the employees seems to have good relations and communicate with each other occasionally, either during operations or in the lunch break.

The human performance is a huge resource and in this port, as other ports, the operations depend on the human factor.

"It is important to keep in mind that humans are individuals. By this, I mean that humans should not be streamlined or pushed too much, which may lead to an opposite effect in the way of demotivation and fatigue" (E1).

To find a proper balance, where the employees are sufficient busy in operations, but not overloaded, may be expedient.

"Furthermore, I believe that when employees are motivated or have ownership of their jobs, it is probably easier to achieve an efficient workplace. The fact that the

performances by the employees is being recognized, is believed to motivate further performances of good quality" (E1).

As known from the theory section, concerning the human factor, there is large focus to the human being and systems - how the interaction is between them. The systems and humans has to adapt to each other, and an approach to ensure goals such as efficiency and productivity has to exist.

If the efficiency of the operations is to be improved, factors has to be taken into consideration at the organizational ergonomic level. This means, among other factors, the efficiency of the organization and management, communication, and clear design of working hours.

For this port, both communication and design of working hours is clarified. The communication is interpreted, in this case, as the sharing of information between each other, as well as the employees carrying walkie-talkies. This way, the employees may always communicate. At the same time, communication includes clear goals and understanding for responsibilities by the employees. As mentioned earlier, all employees in this port, seems to be aware of their operations and responsibilities, as well as how to handle different situations.

Working hours are also an important factor. In this port, there are both employees working normal working hours, typically 8 to 16, and employees working on a shift scheme, which typically means later working hours and weekends.

The employees expressed that if some days are more or less busy than expected, a new plan will be introduced and employees will be summoned or returned home. These factors indicate a clear design of working hours for the employees.

Regarding efficiency in the organization and management, mentioned in the section on efficiency. The operations are efficient probably due to technology which constantly updates information.

The benefits of both organizational and management efficiency, communication and clear design of working hours are improved productivity and efficiency.

For Westport, this will, among other things, lead to reduced absenteeism and employees feeling greater commitments for their jobs. And for society, it will lead to reduced health and accident costs, as well as contribute to economic, environmental and sustainability factors (Song and Panayides 2015).

One last element in this context as part of ergonomics, is to clear the goals in the company. To achieve their goals, for the company it is beneficial applying strategies, structures and the working environment.

The working environment in this port seems to be positive, and it appears that the employees operates in a strategic manner, where the different operations are structured and the employees has various responsibilities (Song and Panayides 2015).



Picture 4: Some of the quay areas from the visit at Westport

6.5 SWOT- analysis

A SWOT- analysis highlights strengths, weaknesses, opportunities and threats in a company or to an issue. According to Wijnolst, 2009, the strengths and weaknesses concern today's situation and internal relationships, while opportunities and threats focus on the future and growth (Chew, Lee, and Tang 2011).

Key factors for strengths and weaknesses due to a SWOT- analysis in a port are highlighted as location, hinterland connections, equipment, performance, experience, efficiency, adaptability, resources and services adding value.

Key factors for opportunities and threats include technological assessments, market identification, the value chain of the port as well as assessment in relation to legal and regulatory conditions (Bichou 2009).

This SWOT- analysis is based on findings from the interviews and the observation conducted in connection with the thesis.

Each of the elements in the SWOT- analysis are analyzed according to the foundations.

| Strengths | Weaknesses | Opportunities | Threats |
|--|--|---|---|
| <ul style="list-style-type: none"> • Technology • Smart Terminal System • Information sharing • The human factor • Pre meetings • Good physical environment • Well organized port areas | <ul style="list-style-type: none"> • Paperwork for general cargo • Lack of faith in capacity | <ul style="list-style-type: none"> • Smart Terminal System for general cargo • Information sharing • More automated billing system and customs clearance • Interaction and communication between the crane in port and the Smart Terminal System • The human factor • More advanced cranes • Labour morality in relation to salary • Take advantage of less busy days • Obtain robots and drones | <ul style="list-style-type: none"> • Downtime • Weather • The market • Time spent in call • Labour morality in relation to salary • Cargo not withstand water |

Table 2: Findings from the SWOT-analysis

6.5.1 Strengths

- Technology

In this port, the technology is suitable and used each day in their daily operations. Large part of the operations is done through or by using technology tools or solutions.

The reason why technology is categorized as a strength is as it contributes the operations to be easier in terms of saving time, operational possibilities, and efficiency. At the same time, considering the environmental aspect, it reduces the use of paper due to the use of digital tools.

- Smart Terminal System

This factor is of course in terms of technology, but deserves a separate section due to its ease of use and efficiency for this port. It is apparent from the employees in the port that this has been a good investment, in terms of the advantages of the system. An example is the information flow which reaches the parties involved and cause saving time. The system contributes the trucks to book time in the port, and the employees in the port has an overview of number of trucks inside and which has left the port.

At the same time, the system is linked to the gate the trucks pass through and photographs the cargo.

The system also specifies arrival and departure times for ships. As well as updated times when the ships have arrived and departed (ETA and ETD).

The weather is updated at any time in the system, as well as collaboration with billing and customs clearance systems is also a part.

This is a complete system, which contributes daily exercises and operations to be easier for the employees at Westport.

- Information sharing

Sharing information is alpha and omega. The sharing of information contributes the processes to flow better and the human operates more efficient due to correct information. The time spent in the port and terminal area will may be reduced by sharing information. The technology will be an important factor in order to make the information flow as best and fast as possible.

Information sharing is widely used in this port, a lot due to the Smart Terminal System. All parts of the port and terminal area are dependent on correct and updated information, so it is crucial sharing it.

- The human factor

Competent and positive employees create the working environment in the port. To be seen by the management, as well as the performances, is appreciated and creates motivation and a positive environment.

At the same time, due to the management appreciates the value of the human factor and the operations depend a lot to this factor.

The importance of humanity in the port and terminal area is seen as a strength, as it is a valuable resource and the operations are dependent by human factor.

- Pre meetings

Pre meetings with the flagman and the mate onboard the ship in advance or at the beginning of the day, is considered to be positive by the employees. The meeting has the purpose to get through to-do list of the day.

This meeting will therefore be a strength for this port, as it has the purpose to make every day more manageable and straightforwardly.

- Physical environment

The physical environment is important for a well-functioning port and terminal area. This means, among other things, the groundwork in the port, the organization of the area, as well as machinery and equipment are factors that may determine whether the operations are carried out as expected.

In this port it is expressed that the physical environment is good and that there are no prominent challenges in the daily operations. The environment is considered to be a strength, as it contributes to a well-functioning operation.

- Organized port area

A port area well suited for necessary operations, is also a crucial factor for a successful operation.

This means, among other things, that the quays are located close to each other within the port area, the ships arrive without any major problems and organized for operation to avoid chaos.

The port area is expressed to be well adapted for the current volume of cargo, and the quays are close to each other. Thus, there are short distances within the port area, which makes operations more flexible and time-saving.

The port area is defined as a strength for this port.

In summary, the strengths are the technological system, including the Smart Terminal System, information sharing, as well as appreciation of the human factor. The advantage of having pre meetings, and not least the physical environment and the facilitation in the port area.

6.5.2 Weaknesses

- Paperwork for general cargo

Cargo transported as general cargo still require paperwork. The paperwork requires more time in relation to processing and signatures. The employees suggests that this type of cargo also may be handled within the Smart Terminal System, to take the advantage of the system for this cargo as well.

The paperwork for general cargo is a weakness or challenge for the port as of today, which may be processed.

- Capacity

The physical environment and port area are adapted for the current volume of cargo transported. It is assumed that a larger number of cargo transported at the same time will not be manageable or possible. It may not be necessary for a greater capacity of volume of cargo, but if the port will grow in terms of capacity or handle larger volume of cargo than today, the employees think this is not manageable.

The capacity is seen as a challenge or weakness, which may be improved.

In summary, the weaknesses or challenges in this port are defined as paperwork for general cargo and the capacity for a larger volume of cargo than the current amount.

6.5.3 Opportunities

- Smart Terminal System for general cargo

By developing the system used for container cargo, to be used for general cargo is an opportunity for this port. The system seems to work appropriate for cargo in containers, and may probably benefit the same for general cargo as well. This will simplify the process and paperwork can be terminated. The challenge developing the Smart Terminal System for the general cargo, is the part for documentation, as photographing the cargo. A container may be easy to photograph from all angles, but general cargo can be more complicated. The employees photographing the pieces, may be the solution. In this way achieving more detailed pictures than the gate. General cargo may probably be challenging to photograph through the Smart Terminal Gate.

The Smart Terminal System is classified as a strength for the port, and developing the system for general cargo as well, is seen as a great opportunity.

- Information sharing

Information sharing is already defined as a strength for this port, but it may also be defined as an opportunity. The reason is because the information sharing can be developed and used to an even greater extent. An example that appeared during the interviews, as there is a desire by the employees for more information flow between ships and the port in advance the arrivals. This may lead to knowledge about which cargo the ship is carrying, and may be possible to implement in the Smart Terminal System. To share this information, both parties may save time and the employees in the port are prepared of which containers are to be shipped. A call can last twice as long if the containers the ship will bring from the port is located at the bottom of the container stacks. This can be prepared in advance of the call, if the employees in the port have the necessary information.

The example emerged during the interviews, and there are certainly other areas of information sharing that has potential due to improvement.

Information sharing is such an important resource in a port and terminal area, and is already defined as a strength for this port, and there are still areas for improvement.

- More automated billing system and customs clearance

After a call, the employees need to process the invoice for the operation. The Smart Terminal System is linked to the billing system, but it emerged during the interviews that it would have been easier if the process from completion of a call to the billing was automated to a larger extent. The employees at the logistics center handles the invoices and approves them in a system linked to the Smart Terminal System. The employees suggested that the person responsible for the call also approves the invoice immediately after finished the call. In this way, reducing the after work for the employees in the logistics centers, as the person responsible for the call will approve and complete immediately.

Regarding customs clearance, it is also desirable for a simpler process. This may also be a responsibility for the person responsible for the call, which could forward a status or acceptance of the cargo immediately.

Despite the communication between the parties in the Smart Terminal System, it is desirable that the mentioned processes to be more automated, and is therefore seen as an opportunity for this port.

- Interaction and communication between the crane in port and the Smart Terminal System

Information sharing has already been mentioned as an important and useful factor in the port. The employees express the advantages of sharing information or communication between cranes serving ships and the Smart Terminal System.

There is already communication between ships and the Smart Terminal System in relation to slots (ETA and ETD), which is probably received from the employees on board the ship. Furthermore, considering the possibility for register factors like load and weight in the system. This information will be stored in the system, making it easier for all parties, as the information needed is available in the common used system.

To develop the information and communication is an opportunity for this port, as it is already developed a basis for sharing information and use of technology.

- The human factor

The human factor has already been designated as a strength for this port. The reason why also categorized as an opportunity, is because the humans are

constantly developing. To benefit and appreciate the possibilities in the human, links the knowledge and resources of the different employees, as well as listen to their suggestions regarding improvement and development are possibilities for this port.

The human factor is a major resource in ports, and the operations performed is highly dependent on the human.

The humans remain a huge strength in this ports, but is also defined as an opportunity in presence, development and resource.

- More advanced cranes

By using more advanced cranes and possibly other advanced equipment in operations, the operations may be simplified by increasing more cargo or combining different cargo in the same lift. This will lead to saving time, but may have a huge investment cost. As for example, ATG or STS cranes are mentioned by the employees as development or investment regarding cranes.

The advantage of ATG- cranes is mentioned to be such as build or stack containers in a more efficient way instead of pyramids, as this port does today. At the same time, by using ATG-cranes, containers are sorted by booking number, which makes it easier to identify them.

Regarding STS-cranes, it is mentioned to be more efficient in use and that all major ports worldwide use this type of crane. The disadvantage is that it is useless for pipes, which is some of the cargo transported in this port.

More advanced cranes are categorized as an opportunity for the port, but will may be anticipated in the long term as it is costly investments.

- Labour morality in relation to salary

In the port some of the employees are working shift hours. Others are "regular" employees by normal working hours. The operations for the different shifts are often the same, as it is expressed, and the work morale may possibly be affected by this. The reason is because the shift workers has another payment than the "regular" workers.

This is categorized as an opportunity for the port, as it can be addressed and possibly discussed. Probably, the employees know the cause of the pay differentials, but it is possibly a theme to discuss if affecting the work morale.

- Take advantage of less busy days

Each day in the port and terminal area is not always that busy. The employees announce that Monday, Tuesday, Friday and weekends are busy, and Wednesday and Thursday are usually less busy.

In the port, it is always attempted to plan an optimal crew taking into account number of calls during the day. Each day starts with a plan for the day, but changes quickly. Suddenly, the crew is redundant or understaffed. In case of redundancy, it is expressed that people are sent home (using time off) and in the case of too little staff, the plan has to be reinstated and employees has to be summoned.

In this industry, the oil crisis has also been noticeable and customers are no longer interested in paying for overtime. If an operation arrives in the afternoon, it may not necessarily be handled this afternoon, and is expected to be completed the next day. Previously, this call would probably have been completed the same day or afternoon. After certain hours at work, the salary for the employees will be different, and the customers are no longer interested in paying more than necessary. To take advantage of less busy days is categorized as an opportunity, as the port have the opportunity to constantly adapt optimal crew and utilize less busy days in a cost-effective manner.

- Obtain robots and drones

In large ports and terminals worldwide, such as Rotterdam, drones and robots are used for daily operations in relation to unloading and loading ships. Some of the employees in Westport suggest to acquire robots or drones for this port as well, and it is therefore classified as an opportunity. The challenge by using robots or drones is that it probably requires standardized cargo and ships. Westport handles different sizes regarding ships and cargo.

It may be an opportunity in the future, as it simplifies work processes for the employees.

In summary, the opportunities can be defined as developing the Smart Terminal System for general cargo, developing information sharing, and a more automated billing and customs clearing process. Furthermore, there is a great opportunity in the human factor, as well as having optimal crew at all times. Communication

between cranes in port and the Smart Terminal system, and more advanced cranes are also suggested, as well as robots and drones.

6.5.4 Threats

- Downtime

As for a lot of technology, equipment and machinery in the port may break down. Then downtime occurs, because the employees are not able to operate or perform. There is not often downtime in this port, but if it happens, it may last for several hours. This create problems for calls in the port, as well as later calls, as operations are delayed. Queues may also occur as a consequence. Unfortunately, this is not to be controlled, in addition to regular services and status on machines and cranes. It is nevertheless defined as a threat, as it may break down the operations and delay work.

- The weather

Situated along the Norwegian coast, the weather has to be handled. The location in Risavika is expressed to be a weather-borne place and the weather may lead to downtime in the port and terminal area.

At a wind speed of 27 m / s or stronger, the operations in the port stops in terms of safety. In addition, ships are struggling to add the quays due to wind and movement in the sea.

First and foremost, the safety of the employees and then machines, cranes and other equipment should not be damaged or destroyed due to the wind.

The weather is categorized as a threat, because it is not to be controlled by the port and may prevent operations.

- The market

The market is also a factor beyond the port's power. Changes in the market for ships, trucks, commerce and oil may affect the activity in port and terminal area. The reason is that the customer depending on transport, and that cargo has to be transported. Weaker economy, due to the oil crisis, also affects and may influence for instance, the payment from customers for completed operations in the port. Changes by the environment, taxes and emissions are also factors that may affect the port and its efficiency.

The mentioned factors above may affect the efficiency, and are therefore defined as threatening to the port and terminal area.

- Time spent by call

As mentioned earlier, the employees operate efficiently at each call. However, if containers, equipment or other items not to be designed for the operations, this may lead to an unnecessarily long call for ships in the port. This may also cause delays for the next call.

Dissatisfied employees on board the ships may become a consequence of long waiting time as well, and the ships may be late for the next port.

The reason why time spent by calls may be a threat to the port, is as it may be costly and cause unnecessary use of time. For the port, it is a possible advantage to have a system of stacked containers which makes it easy to locate them, as well as sharing information, to reduce time spent on calls.

- Labour morality in relation to salary

Some of the employees in the port are paid as shift workers. Others are paid as “regular” workers, as they have the same working hours each week. As mentioned as a possibility, that this possibly affects the work morale. The reason is as a lot of the same operations is done, but for different payments. This may be a threat, because there may be less satisfied employees and a bad atmosphere in the port.

- Cargo not withstand water

The employees mentioned handling cargo that not withstand or may be destroyed by water. These are cargo such as gluten, sugar or protein. As Risavika is a weather-borne place, due to a lot of rainy days during the year, this is a challenge for the employees. An operation that should last for 12 hours, may last for up to 3 days due to the weather.

These types of cargo are therefore defined as a threat, as it suspends calls and may cause queues in the port.

In summary, threats to the port and terminal area may be downtime and the weather, as well as changes in the market. Furthermore, time spent in each call as well as cargo not withstand water may also be threats.

7.0 Discussion

In this chapter, the analysis will be discussed against the research questions and relevant theory. The purpose of the discussion is to provide an appropriate basis for highlighting the main theme and subsequent research questions.

The research questions to be answered are "What factors affect or lead to an efficient port?" and "What are the most important factors in port efficiency, considering JIT, LEAN and ETA and ETD?"

Section 7.1 will consider the first research question, and following the second research question in section 7.2.

7.1 Factors leading to efficiency

The first part of the discussion will elucidate factors that emerged as important during the interviews and the observation, and were analyzed in the above section. Theory related to the various factors will also be included in order to respond appropriately to the first research question, focusing on the factors which affect or lead to an efficient port and terminal area.

Affecting is defined as influencing and the verb to lead, may be defined as pointing to (Språkrådet 2018b, a).

A factor may be defined as something that is a contributory circumstance. In this context, something that contributes to a port and terminal area operating efficient.

But what does efficiency in port and terminal really means?

Definitions of port efficiency are many, and some main elements are: it is an important part of shipping costs (larger ships lead to costs for waiting for services in ports), updated facilities, and available equipment in the port. Furthermore, information technology is a factor that has a large impact on port efficiency, as well as infrastructure, frequency of calls, problems (such as downtime), facilities and scale economics.

In terms of efficiency in the terminal, allocation of available resources has a major role. In the process of handling containers at the terminal, the available resources may be a bottleneck (Chew, Lee, and Tang 2011).

The definitions highlight several aspects both contributes and lead to efficiency. In the analysis section, various factors may lead to efficiency appeared by the employees during the interviews. The most important factors from the analysis that will be discussed are as follows: information sharing, information technology, Smart Terminal System, equipment, facilities and the human factor.

7.1.1 Information sharing

“Adequate information sharing is one of the key factors which will highly improve the efficiency of supply chain” (Liu and He 2006).

Information sharing is the first factor to involve in the discussion. This is an important factor in achieving an efficient port and terminal area, and it appeared during the interviews that the employees agreed.

There are three different ways to share information, according to (Olesen, Hvolby, and Dukovska-Popovska 2013). Either manually, by phone, email, a meeting, or by a database access in the form of an ICT system (for example, ERP, where the different parties have a link to the database and may read and write in real time), or an ICT system dedicated to information sharing (this system contributes to implement simple database integration) (Olesen, Hvolby, and Dukovska-Popovska 2013).

During the visit in the port, the communication is perceived both by telephone and email (and also meetings), but most of the information sharing is technologically, by a system. This is the previous mentioned Smart Terminal System. Through the system, employees get access to most of the necessary information regarding ships and trucks, as well as cargo.

Thus, in this port a dedicated system is developed and used, which is appropriate for sharing information in the right place and on time.

An information sharing system should preferably be easy to use and able to supplement and add information. It should also be automatic, no paper, and in real time (Olesen, Hvolby, and Dukovska-Popovska 2013).

The technology and system used in this port and terminal area seem to be user friendly. It looks transparent and the information is categorized in relation to the employees operations in the port and information needed. The system is suitable to supplement or add information, due to some of the information is recorded by the employees, such as when a ship actually arrived or measured temperature of cargo. In addition, there are also information that emerges automatically, and the information is in real time.

"Information sharing is the act of sharing information between separate organizational units" (Olesen et al. 2014).

This means, therefore, that any information shared between different units, and the sharing has interpreted either verbally, in writing or by systems supporting it.

Furthermore, recent studies show that there is a great need to share information through a system and that such a supportive system has to be developed. By a supportive system, the information sharing also will consist of real-time data, which in turn will lead to better planning, the waiting time will be reduced and the utilization of available resources will also increase (Olesen et al. 2014).

A well-developed and suitable IT- system, as mentioned above, may therefore increase to achieve a new and higher level of information sharing.

From the observation and the interviews, it appears that information sharing is top of the list of important factors regarding efficiency. As one of the employees expressed; "Information sharing is alpha and omega for efficient operations". At the same time, most of the information shared in this port, is through their self-developed system, the Smart Terminal System. This is well supported by the theory, which states that dedicated IT-system contributes to increased information sharing.

Furthermore, the IT- system which may lead to increased information sharing, has to first and foremost exist. Trust in this case is an important factor as the system concerns many resources to be shared. It is recommended to share resources in line with the comfort zone and from there, it will be possible to gain trust (Olesen, Hvolby, and Dukovska-Popovska 2013).

Another element to exist, is the availability of data and, in particular, ensure the quality of the data (as well as having the necessary data) (Olesen et al. 2014) (Olesen, Hvolby, and Dukovska-Popovska 2013).

At last, the complexity of the technology and the system has also to be considered. It is sensitive for ports to share information, and especially accurate information (Olesen, Hvolby, and Dukovska-Popovska 2013).

The main benefits of sharing information in ports according to (Olesen et al. 2014) are to contribute planning adaptation and including schedules that are external. At the same time, strengthens the ability to make adjustments and operations, which in turn makes it more flexible to adjust and adapt the production system (Olesen et al. 2014)

Sharing of, for example, time for arrival of ships allows the port to plan the number of employees at work at the accurate time. The ship has to report within three hours of arrival, if they are delayed, in addition to plan the number of employees needed to the various operations in the port and the terminal area.

A large contribution to activities which not create value is lack of or no planning and flow of information. In order to improve this, for example, by registering the containers before arrival, the trucks planned arrival and the employees in the port and terminal area are informed as well.

In this port and terminal area, trucks plan their arrival in advance, by an iPad located in each truck. By this, there are shared information about whom and when to arrive.

In other words, uncertainty has to be minimized and plans have to be based on the information the company receives from ships and trucks (Olesen, Hvolby, and Dukovska-Popovska 2013).

7.1.2 IT – Smart Terminal System

The next factor to discuss is IT systems, and for this port the Smart Terminal System.

From the section concerning information sharing, the following are required for or the sharing of information is missing due to the following factors: availability of data and its subsequent quality, and technology or system complexity.

These elements will be discussed towards the Smart Terminal System.

Availability and quality are the first two elements to discuss. The system or technology may, probably, be intended to simplify, save time and assure quality in processes. By developing the system, the Smart Terminal System, this port has developed all the necessary information for daily operations available in one system. This makes it easier for the employees and is time-saving. A few keystrokes and the employees has the information needed for different operations in the port. The technology used in this port is considered to be able to make the information available. Furthermore, regarding quality, the quality of the Smart Terminal System seems to be appropriate. There is nothing disclosed about system problems, or any inconveniences. Nevertheless, it is mentioned some requests regarding system development: some adjustments in more automated billing and customs clearing processes, which will require less resources from the employees.

The next point also essential for a successful and well-functioning system, or the use of technology, is complexity. It is important that the employees are comfortable by using the system and may utilize its features. Thus, it is an important factor that the system is not too complex and advanced. Based on the explanations by the employees, the system is easy to use: the menus are listed on the left side, and by choosing categories according to the necessary information.

As an opportunity for the system, it appears by the employees, it is suggested to have general cargo implemented in the Smart Terminal System. This will probably increase the availability of information, because all types of cargo will be included in the same system.

Again, this contributes to save time and acquire quality, and will be a positive consequence as well as paperwork hopefully will be eliminated.

7.1.3 Equipment and facilities

The third factor that appears to be essential in terms of efficiency in the port, is facilities and equipment. In other words, the quality of the port and terminal infrastructure is crucial for efficiency.

In this section, statements from the employees are included, as well as an article concerning this.

The employees point of view due to the facilities in the port area is well-functioning. The port area including the quays are located close to each other, and at the same time room for larger ships to be in the port at the same time. The terminal area is close to the port area, and is seen as positive and expedient by the employees. This means, short distance from unloading to the area of storage cargo. The terminal area is also referred to as suitable, by large areas for stacking and storage of cargo.

At the same time, there are several indoor storage possibilities for special cargo, which indicate utilization and structure.

The entry and exit of the area is organized by gates, and the trucks arrive directly into the area for loading and unloading containers.

In other words, the area is well-structured and easy to locate.

On the other hand, appearing from the interviews, the volume of cargo and traffic in and out of the port and terminal area is considered to be at the maximum of capacity. It is assumed that a larger volume of cargo will not be appropriate or reasonable as there is no capacity for this by today's facilities.

Regarding equipment, there are different types of cranes, trucks and other types of vehicles used in the area. The employees emphasize the importance of the correct equipment.

Throughout the interviews, it emerged that more advanced equipment for placing containers, as well as loading and unloading ships and trucks, is suggested.

The employees express that their equipment are suitable, but more updated equipment may do operations even more optimal and efficient.

The area is also well developed, and there seem to be no barriers or hinders to the operation in the port and terminal.

The interviews also reveal the importance of holding a range of different equipment, as it sometimes occurs cargo of special shapes which makes it difficult for the employees to handle. Therefore, it is important to have available different types of equipment, which contributes to find a solution quick and easy.

A possible disadvantage of investing in new and more modern equipment is the cost element. At the same time, the equipment may demand more space in the area. It may be a huge investment at the time, but may contribute to save time and other cost-efficient factors nevertheless.

On the other hand, there are no objection that the equipment used today not are appropriate for the port operations. This may be a review for Westport.

A report prepared by the Coastal Administration and Marintek in 2006, discussing different factors leading to efficient terminals, and several of those discussed appears in this area. Some of the factors that are relevant in this context will be highlighted.

The report emphasizes gates for entry and exit of the terminal which works efficiently, and contributes to an efficient port and terminal area.

The report also emphasizes that the flow of cargo in the terminal area should be optimal, to obtain an efficient operation.

Furthermore, that areas for loading and unloading has to be appropriate. At the same time, investments in equipment has to be adapted to the type of cargo and the size or volume of cargo.

One final point emphasized, as crucial to the efficiency, is well-functioning due to decks, quay fronts and lighting as needed in the area (Kystverket 2006).

These are all factors that should be taken into account in relation to the port and terminal infrastructure. Westport already use gates for entry and exit the area. This is expressed to work optimally.

As for areas for loading and unloading as well as freight flow in the terminal area, it is also stated as appropriate. There are short distances from ships and trucks to storage of cargo, which means efficient operations.

Investments in relation to volume and type of cargo affects the discussion above. The equipment used today are suitable, but the employees suggest more advanced equipment tailored to the volume and type of cargo, as well as a more efficient handling.

Adapting needs with regard to quays, lighting and decks, is also appropriate. The quays are, as mentioned, placed together with space for different ships, and is adapted with lights and decks.

7.1.4 The human factor

The last factor to emphasize in this context, as essential when discussing factors that affect port efficiency, is the human factor. In this section some elements from the theory section, as well as factors expressed by the employees, will be highlighted.

An important element for port efficiency proves to be clear and defined goals. This means, that a strategy and structure has been mapped for how to achieve the goals, as well as the working environment.

This port seems to have a suitable structure for the performances and operations, and a strategy may be identified in addition to achieve their goals.

The working environment is also an important factor. The impression is that all the employees are positive and energetic, and communicate with each other. There is a positive atmosphere in the operations and during the lunch break.

The employees seem to be serious to the operations, but at the same time a positive atmosphere.

Furthermore, the science of work will be highlighted, which ergonomics is defined as. Within this terminology, factors such as social needs, theory and practice, education, management and technology and environment are crucial factors (Song and Panayides 2015).

Social needs include many factors, the focus will be addressed to be noticed, and also the social element which includes to be surrounded by people. This is also apparent from the interviews, as elements important for the employees. As well as the human factor as a huge resource during operations in the port. It is important

for the management to emphasize the employees and their performances, both through words as well as development through courses, further education or certifications.

As far as technology and the environment are concerned, it is also apparent in the interviews to keep in mind that the human factor is only an individual. By this, to avoid overloading the human, and the importance of keep in mind that there is a difference between a human being and a machine. The focus should be to continuing the interaction between employees and technology, that both elements complement each other and humans may benefit from the technology.

Operational efficiency may probably be improved by taking into account several factors. These are the efficiency of the organization and management, communication between parties and the planning of working hours.

Efficiency in the organization and management is related to communication, as goals, strategy and tasks that has to be communicated from management to employees. Furthermore, the organization has to use communication and information in between, and external elements for the best possible efficiency. The information exchange element is also included, as this is an important factor affecting all elements in the port and terminal area.

At the same time there are different working hours, some by shift schedules and others by "normal" working hours. In order to achieve the best possible productivity and efficiency, the question is if employees should be included in the preparation.

In any case, all employees may be influenced, to the extent the opportunity to report the desire for working hours.

If an organization achieve improved productivity and efficiency, this will also affect organizational factors such as reduced absence and employees achieving a greater commitment to their jobs.

Port organizations will be able to gain knowledge and talent among employees, as well as productivity, if the human resources are managed efficiently. In this way,

focusing on potential and possible solutions and opportunities will contribute to maximize the human capital (Safa et al. 2018).

With this in mind, the port has the opportunity to take advantage of the human capital, by placing the correct knowledge in the different positions, and highlighting talents as far as possible. This may be promotion or expansion in terms of certificates or other operations in the port. This may affect the employees positive.

By having the correct employees in the different positions and job affiliation, opportunities and resources are utilized, and the port will probably achieve the most productive operations.

7.2 The most important factors in port efficiency, considering JIT, LEAN and ETA and ETD

In this chapter, the four most important factors, which are defined as most important, will be considered for efficient operation in port and terminal. These are information sharing, IT, equipment & facilities and the human factor, and linked to three probably decisive elements: JIT, LEAN and ETA and ETD.

JIT – just in time

LEAN – minimizing waste

ETA/ETD – estimated time of arrival and departure

7.2.1 JIT and LEAN

Just-in-time is a strategic method developed in 1950 by the Japanese company Toyota. The purpose of the method is to minimize waste and time and thus deliver or produce exactly when needed - Just-in-time (Porten 2008).

There is no clear distinction between JIT and LEAN, but LEAN may be said to have the purpose of eliminating waste (Wallace and Hopp 2008).

Marlow and Paixao (2003) emphasizes leanness, minimizing waste, as a factor leading to the success and efficiency of the port (Song and Panayides 2015).

In this master thesis several of the efficiency factors are affected by or affect JIT. As for LEAN, the goal is to assess the unnecessary work, thus eliminating situations and operations defined as waste.

The first factor to discuss is information sharing in relation to JIT and LEAN. The need for proper information has been highlighted, but in this context it is also important to emphasize the importance of sharing information in the right time. Information about an upcoming call or truck, that the staff in the port receives after the ship or truck has arrived in the port, is of little value. Thus, it is important to share information exactly when it is needed. At the same time, it is necessary to consider the difference between valuable information and waste, which is unnecessary.

This leads to IT-systems considering JIT and LEAN, where IT-systems is the channel to share the required information exactly when needed. Well-developed systems, such as the Smart Terminal System, where information about trucks in the area, ships arrival times and measured temperatures on freight may be shared, is seen as a huge advantage. Also in this context, it is necessary that employees are able to assess valuable information in the system, as there is probably a lot of information shared in system. In this way, employees may eliminate information in the system which is perceived as waste.

At the same time, employees carry walkie-talkies, which are also considered as technology in this context. The walkie-talkies allow employees communicate when needed and share what is necessary, regardless of their location in the port and terminal area.

This leads to the importance of the human factor, and its operations and delivering just in time. This means, having the right people and labour in the right places, just in time, such as waste is minimized and operations may be performed without waiting time. The importance of the human presence in the right place at the right time.

Finally, in order to operations performed and to be delivered and executed on time, and without allowing customers to wait unnecessarily, the importance of suitable

equipment to perform the operations is highlighted. At the same time, the facilities have to be suitable, and not an obstacle.

Spending unnecessary time on facilities and equipment, as a cause of not suitable or lack of equipment, may probably be unnecessary use of time. Thus, it is important that facilities and necessary equipment for different operations are organized to avoid wasting time to arrange. If not, there may not be value creation for the employees, in the sense that the employees are supposed to provide services to the customers, creating value, and not spending time looking for appropriate equipment.

Coltof (2000) highlights the availability of port facilities, hinterland, port service quality and reliability as factors defining a port as successful and efficient. Quality of service and reliability in particular, reflects JIT and LEAN. What matters is to provide when it comes to and that the customer may rely on deliveries each time (Song and Panayides 2015).

All elements that affect and are influenced by JIT are present at Westport.

7.2.2 ETA and ETD

The terms most commonly used on arrival and departure of ships is ETA and ETD. ETA is defined as estimated time of arrival, and ETD is defined as estimated time of departure (Lind 2016) (SALLEH 2017).

As for ETA and ETD, information sharing is relatively dominant. Sharing information, the various ports and terminals has the knowledge about when the different ships will arrive and depart. In particular, arrival is of major importance, and it appeared by the interviews that ships have a deadline to share, as exact time of arrival as possible, 3 hours in advance. The exact time of arrival is recorded when the ship actually arrives. This means that information from the ship has to be shared to the port and terminal, whether by telephone or by other technology. This means that ETA and ETD relates to the use of technology.

To share the time of arrival and departure, technology is used to a large extent, as well as to update to exact time of when ships arrive and depart. Notteboom and

Rodrigue (2005) emphasize a success factor for an efficient port, the availability of powerful information channels (Song and Panayides 2015). For this port, Smart Terminal System is used, which is a system where ETA and ETD are registered in advance, and updated exact time of arrival and departure time afterwards. Smart Terminal System contributes to share the information to the employees dependent on the information.

Bichou and Gray (2004) emphasize the importance of interacting with channel members, which may be linked to an updated time of arrival and departure to succeed as an efficient port (Song and Panayides 2015). This allows more members of the chain to reach updated information about when ships arrive in the port.

The human factor, is also influenced by the ETA and ETD, to the extent that the employees in the port has a time to relate to, and may prepare operations in addition to this time. This means that employees plan and arrange the containers and other cargo for the ships, as well as equipment to be used in operations.

It is important to highlight facilities and equipment as a relationship to ETA and ETD as well.

The reason why it is necessary, is that the employees in the port and terminal area have the correct and necessary equipment for operations, and that the facilities are adapted for the operations, which leads to influence ships to depart to the expected time. This will affect positively for the next arrival of ship, meaning that it is possible to arrive as expected, as a result of the last ship departing as expected. A result this may lead to efficiency in the port.

Song and Panayides (2008) also emphasize that quality, reliability, customization and responsiveness should be highlighted in a port to be efficient and successful (Song and Panayides 2015). ETA and ETD may affect all the factors, with updated information through technology, customers will experience quality and reliability. Simultaneously a human factor that is operating and use correct equipment and suitable facilities, customers may experience customization and responsiveness.

8.0 Concluding remarks

In this master thesis the focus has been on efficiency in port and terminal area. The aim has been to highlight factors that contribute to efficient operations in the port and terminal area.

A qualitative study with exploratory research design have been conducted, as well as a case study in order to answer the research questions.

In section 8.1 the analysis and discussion will be summarized, and end up with a conclusion on factors that lead to efficient operations in port, as well as which underlying factors that are contributing to efficiency.

Section 8.2 further research will be proposed.

8.1 Conclusion

The master thesis theme is efficiency for port operations, and the cooperation have been to both Grieg Logistics AS and Westport AS, where the latter has been to investigate the topic.

Based on the overall theme and the preparation of a specified issue, the following research questions have been defined:

Research Question 1: Which factors affect or lead to an efficient port?

Research Question 2: What are the most important factors in port efficiency, considering JIT, LEAN and ETA / ETD?

Through the observation and the interviews there have been gained insight into various factors that affect the extent to which the operation of a port is efficient. The findings indicate that Westport operates and focus on several factors that also emerge as efficiency-enhancing in the theory.

The factors that are emphasized to have a major impact on the efficiency of the port are information sharing, technology (IT), equipment and facilities as well as the human factor.

They are all influenced to underlying factors, and are presented in a figure below. The figure summarizes the findings in the analysis, as well as the factors that

emerged as underlying and became decisive as influencing, through the interviews, the observation and the discussion.

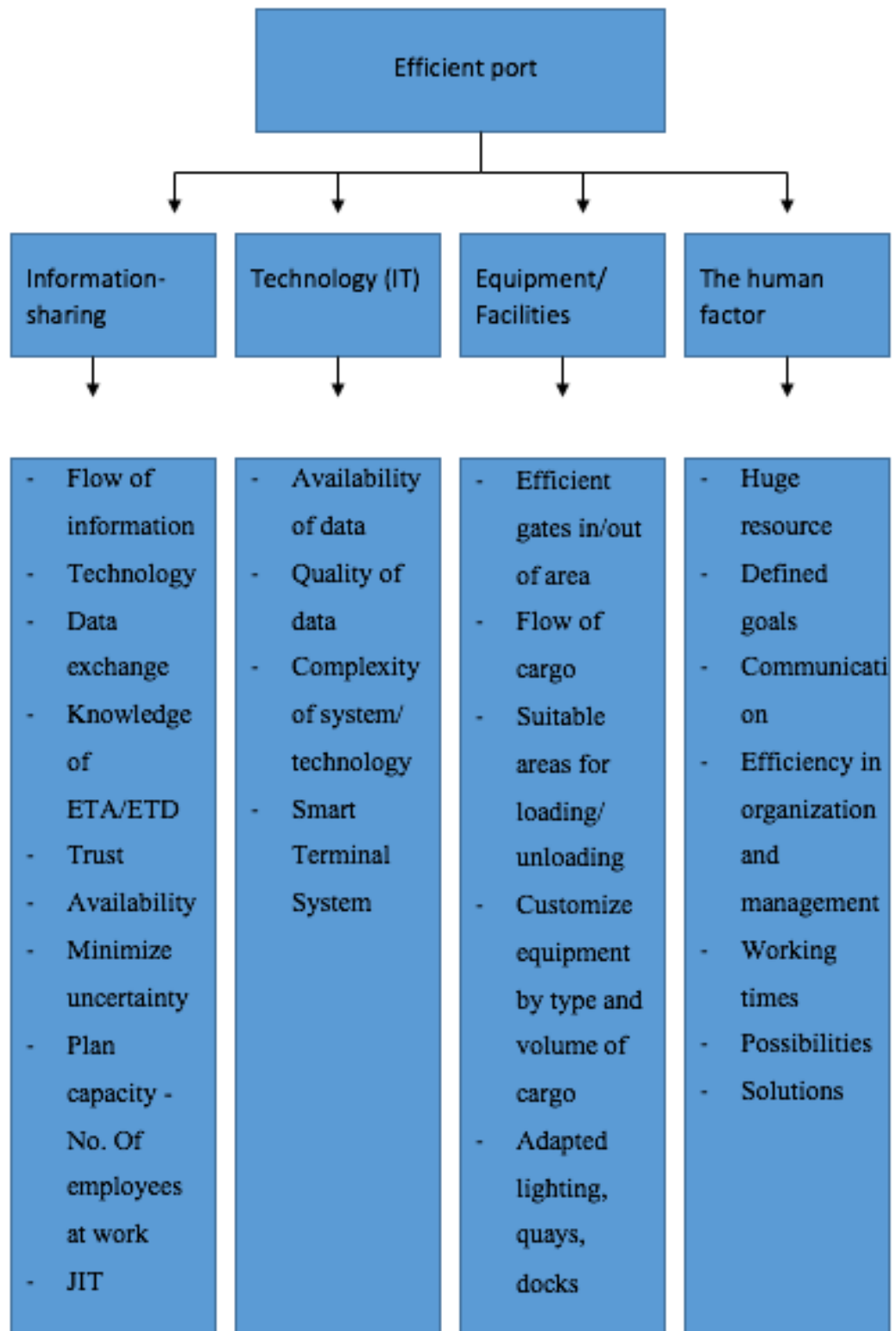


Table 3: The findings

In summary, the research questions prepared, presents a picture of which factors ports should consider in terms of efficient operations. The underlying factors are highlighted and should be emphasized to achieve efficiency through sharing information, technology, equipment and facilities as well as the human factor.

8.2 Further research

The theme of the master thesis is challenging and may affect in a cost-effective manner if ports succeed in streamlining.

This master thesis has made some limitations, partly considering the scope and not least the time perspective. There are several elements that could be done differently, including the size of research could be larger. This means that it could include several ports and terminals, as well as other factors could be studied deeper. Thus, the master thesis could have a different angle, i.e. comparing ports, highlighting the factors that each port has succeeded in improving efficiency. It could either have been interviewed more employees in different ports, or used surveys in other ports and compared the results. This is defined a basis for further research.

Other suggestions to research on efficiency are due to a quantitative study, where it is possible to measure and compare results in terms of numbers. In this context, various factors could be compared in each port and results or findings measured in numbers.

The findings in this thesis are highlighted with regard to the chosen port and company, specifying the technology and other factors this port uses.

The context of the thesis is more generalized, in addition that other ports should be able to use the findings and then adapt specifically to the designated port.

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10.0 Appendix 1

Interview guide:

1. Name of the port and terminal area
2. How does the terminal operate today?
3. What is the area of the port and terminal?
4. How many tons of cargo to be handled per year?
5. Which type of cargo is handled in the port? Container, bulk, general cargo?
6. How many employees in the port and terminal?
7. What are the different operations?
8. How are the physical conditions in the port?
9. How many calls are there within a week in general?
10. What is done efficient in the port today?
11. What is done less efficient today?
12. Suggestions to operate more efficient?
13. Suggestions to optimize operation?
14. What is operated most optimal? Suggestions for optimal operation?
15. How is the information flow in the port? As well as in and out of the port?
17. What are the employees contribution for the operations to be streamlined?
18. Do the port use digital tools, or to what extent is paper used?
19. If not using digital tools, how to improve it?
20. How is the working culture in order to reach times and to be "just-in-time"?
21. How is the working culture in terms of the value chain? Do the employees consider rest of the chain?
22. Do the employees feel ownership of their operations?
23. How many trucks are there in the port and terminal area?
24. How much downtime is there in the port and terminal area?
25. What is the largest challenge in the port and terminal area?

11.0 Appendix 2

"Sharan Merriam (1998) operates with six strategies when obtaining observation:
(Krumsvik 2014)

Observation guide:

1. The physical setting: What is the physical environment? What is the context? What kind of behavior is the setup designed for?
2. Participants: Describe who is in the setting, how many people it is and their roles. What are these people doing here?
3. Activities and interactions: What is happening? Is there a definable sequence of activities? How interacts the person with the activities and each other? What social pattern does it reveal?
4. Conversation: What is the content of conversations in this setting? Who is talking to who? Who listens? Site directly, reformulate and summarize the conversations.
5. Key Factors: Not so explicit factors, but still important factors may be:
 - a. Informal and non-planned activities
 - b. Symbolic and connotative meanings by words
 - c. Non-verbal communication as clothes style and physical space
 - d. Discrete goals as physical hub
 - e. "What is not happening?" – especially if it should have happened
6. Your behavior: You are as much a part of this setting as the participants are. What is your role, even as an observer or close to participants, which affects the scene you observe? What do you say and do? "