TALLINN UNIVERSITY OF TECHNOLOGY

School of Business and Governance

Department of Business Administration

Niko Yli-Tainio

A COMPARATIVE ANALYSIS OF THE DIGITALIZATION PROCESS AND ITS IMPLEMENTATION IN THE ESTONIAN AND FINNISH PORT INDUSTRIES

Bachelor's thesis

International Business Administration, Marketing

Supervisor: Eunice Omolola Olaniyi

Tallinn 2018

Tallinn 2018

I declare that I have compiled the paper independently and properly cited all material and data collected by other authors. This paper has not been previously handed out for grading. The length of the document is   words, from the introduction until the conclusion.

Niko Yli-Tainio, ………………………………….
                           (signature, date)

Student code: 145770
Student e-mail address: niko.ylitainio@gmail.com

Supervisor: Eunice Omolola Olaniyi:

The paper conforms to requirements in force:

…………………………………………..
(signature, date)

Chairman of the Defense Committee:
Permitted to the defense

…………………………………………..
(name, signature, date)

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

Digitalization has created new kind of ways to do business in port industry. This paper studied the what kind of risks and opportunities digitalizing processes in ports can create. The method for the study was to conclude through interviews which were presented for people who work closely with ports that are in the Gulf of Finland.

The port industry in Estonia and Finland had a relatively good sight in adopting digital innovations. Ports of Kotka, Helsinki and Tallinn did realize that they will be needed to keep implementing new technologies match the rising demand.

The impact of digitalization was seen as a useful asset that improves the operations that are already ongoing. The most significant findings were that digitalization improves the level of efficiency with automation and better communication and data exchange. It was also seen to reduce cost significantly.

This study aimed to answer three questions about the digital environment in the ports. The first question was how digitalization has created value for the port industry in Estonia and Finland. The second questions aimed to find out what kind of threats digitalization poses to the port industry. The third questions tried to see what kind of new business opportunities digitalization makes possible for the industry.

Key Words: Digitalization, port digitalization, port industry, opportunities, threats

INTRODUCTION

The third economic revolution that is currently taking place, is increasingly urging organizations to fully digitalize. In this regard, transformations in all business fields from marketing to production, are posing challenges which companies aim to combat through digitalization. In response to the ever-changing business environment and requirements, companies employ digitalization for generating change in all activities, processes, strategies and products (Thulesius, 2016). This implies that the use of technology will be increased with the intention to further enhance organizational performance. Kotler (2007) explained that by utilizing digitalization in the constantly changing market environment, companies could increase their competitiveness (Komulainen, 2016).

Digitalization has influenced the traditional ways of creating value and a well-implemented digitalization process can be a valuable asset for empowering a business and helping it gain a competitive advantage (Rajala, Westerlund & Möller, 2012). Digitalization will change the entire structure of work, management, communication and processes mostly through the faster and more accessible internet (Thulesius, 2016). Digital transformation takes effect via four levers, namely automation, digital customer access, connectivity and digital data. The third wave of digital transformation has its focus on the collecting of data that could previously not be gathered and measures for using this data to improve an ongoing business (Yoo, Lyytinen, Boland, & Berente, 2010).

In the maritime sector, digitalization is going to play a key role in the success of the ports (Thulesius, 2016). In order to reach their potential competitiveness, it is necessary for the ports to integrate their systems to the present time as well as continue adopting new technologies. An example of the difference that digitalization generates can be found in the logistics sector. The new technologies offer an opportunity to operate and handle the flow of goods in a more durable way that enables reduced costs and improved efficiency. According to the European Federation of Inland Ports (EFIP, 2017), if a port does not invest in digitalization and information technology (IT), it will not be able to maintain a competitive enough the logistics side.

This thesis focuses on the ports of Helsinki, Kotka and Tallinn in the Baltic region. The reason why these ports where chosen, is because the main ports of Estonia and Finland are both located

in the capital cities and are major cargo points well positioned for shipping activities in both countries. According to the statistics presented in the Port of Helsinki's annual report of 2016, a number of 8 735 000 passengers traveled the Helsinki - Tallinn route that year. The total passenger traffic in the port of Helsinki was over 11,5 million people, which makes the number of passengers traveling to Tallinn approximately 73% of the overall rate. Consequently, these ports have high revenue and for that matter more assets to invest in digital software and equipment. The enormous amount of information and customers involved in these ports emphasizes the need for proper management and handling that can only be achieved through the act of digitalization.

Objective

In this regard, the aim of this study is to:
Evaluate the competitive advantages, threats and opportunities that the digitalization process brings to the port industry in Estonia and Finland.

The research questions (RQ) to address this aim are:
RQI: How has digitalization created value for the Port industry in the Estonia and Finland?
RQ2: What types of threats can the digitalization process pose to the port industry?
RQ3: What possible business opportunities can digitalization create for the industry*?*

Scope

Since the main objective of this work is to explore and explain how the digitalization process has changed the port environment and businesses in Estonia and Finland, the research methods are qualitative and realized through interviewing. Targeted respondents are managers who work in the port industry with the digital processes or are closely related to ports or the digital processes. A total of six people was interviewed, all of whom were involved in the decision-making processes of their respective ports. All interviews were carried out in spring 2018 and there were six interviews.

This study is structured in the following manner: the first chapter reviews the literature work of this thesis where this study provides an overview of the of ports and digitalization. The second chapter consists of the methodology of the study and the research philosophy. The chapter contains the sample selection and the research design of this study. The next chapter evaluates the results

and findings of this study and adds the discussion of relevant targets. The final chapter concludes the main findings and summarizes the study.

1 LITERATURE REVIEW

This chapter contains a discussion about why digitalization is important to port operators. It shows how digitalization enables many opportunities to improve business operations all the way from cargo handling efficiency to marketing. However, wrongly implemented it can have detrimental effects. This chapter also discusses the Finnish and Estonian ports of Helsinki, Kotka and Tallinn as major players in the Nordic economy since both countries rely on import and export although seemingly small on the global scale.

1.1 Digitalization

The world is currently evolving towards an information society and moving further away from the industrial era (Stadler, R., Brenner, W. & Herrmann, A., 2014, p. 18). The corporate environment is shifting towards information centricity on a global scale and in all fields of business. Information and data are "today's oil" and can be harnessed for several purposes (Clive Humby, 2006). The National Report on Digitalization (Divia, 2014) stated that companies are not only looking for efficiency improvements but also for strategical advantages that improve marketing, customer co-creation and branding through interactions in the digital environment.

The various channels and platforms that are provided by digitalization, can enhance the implementation of marketing and branding measures. Thus, companies are able to target their specific audience in marketing in a way that enables them to reach the desired level of attention. Lipiäinen, & Karjaluoto (2015) found in their case study that companies seem to benefit from an overall branding approach, which integrates their internal and external ways of acting. Another benefit of digitalization is that it also improves retail services and information sharing. Komulainen (2016) referred to a case which found that digital transformation is crucial for branding because the corporate world tends to favor partners with a good image. Moreover, public opinion has grown stronger in recent times and will continue to grow in the years to come.

Companies no longer depend on a single sales channel like brick-and-mortar shops but rather on several different channels from which they retail their products or services. For example, online retailing has evolved through digitalization and is taking markets from the regular shops (Doherty

& Ellis-Chadwick 2009). Buyers want to have information about the products or services prior to making a purchase, which implies a need for both, increased communication between the buying and selling parties and increased digital data that can provide detailed information to customers before they make their purchasing decision (Järvinen & Taiminen, 2016). This information flow and the availability have had a transformational impact on product life spans and traditional business models (Chesbrough, 2011). John Chambers, the Executive Chairman of Cisco Systems stated that "At least 40% of all businesses may die in the next 10 years if they do not figure out how to change their entire company to accommodate new technologies" (Ross, 2015). This means that all industries, including the port industry must find a way to harness the digitalization process to benefit from their operations and gain a competitive advantage. The information flow and the availability has had a changing impact on the product lifespan and on the traditional business models (Komulainen, 2016). As Komulainen has suggested, the digitalization process that utilizes new technology and improves the information flow will continue to shape the business models that companies use and inevitably shape the organizational structure, operational functionality, and the overall business process.

1.2 Digitalization in Ports

The maritime industry is also in the midst of the third digital transformation in the global economy. The first and second digital transformation generations mostly focused on establishing the foundation for improved information flows in terminals and port communities and thus enabled and improved terminal automation, trading, and interaction in local and global contexts. However, the on-going third generation mainly targets active measurement, control and the assisting of port operations and port infrastructure by seizing the available data sources and continuous interactions in the port community (Heilig, Schwarze, & Voss, 2017). If ports do not invest in the digitalization process their logistics cannot match the level of competition because only this system can help to manage the flow of the cargo in the port area in a more efficient and cost-saving way. More so, ports who do not invest in the digital process will fall behind because they cannot catch up with other ports that use digital processes (EFIP, 2017).

Companies are looking for different kind of benefits from digitalization and not only efficiency improvements. They seek especially for strategical benefits like customer co-creation, digital marketing, and branding. This implies that the port industry like any other industry is looking to

improve their customer focus to serve them better. According to Murnane (2016), there are three main themes for Ports and shipping industry:

(1) improving customer experience;

(2) commercial excellence;

(3) end-to-end collaboration.

Ports are becoming more customer-focused and paying attention to their branding. There is no better branding than good customer experience and satisfied customers who will talk about their service quality and in an industry like ports where the main focus is in business to business transactions the customer satisfaction is extremely valuable (Lipiäinen & Karjaluoto, 2015).

Venkatraman (1994) analyzed the digital process and created a model of five different levels. The levels are categorized by the impact to the organization from minor impact where a certain business process is changed, to larger levels where redesigning an entire business model (see figure 1).
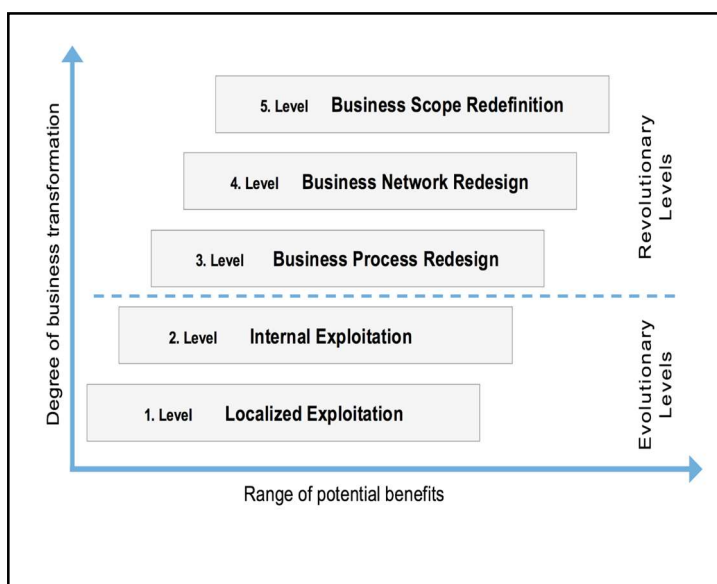
Figure 1. Model of IT-enabled business transformation (Venkatraman, 1994).

The first level depicted in the figure is called localized exploitation and does not have a major impact on the companies processes and in this phase the potential is not fully used. One of the main targets is to improve and offer aid for business functions by improving the basic IT operations. Second, internal exploitation is the phase where the technical side merges with the

organizational side. This could contain a new enterprise resource planning system for the company. The third level is more complex. It is the phase where the company starts to reconstruct and construct existing and new business processes. Also, shaping the organizational composition is needed to gain the advantages of the new IT abilities. Redesigning business networks is the fourth level. In phase four companies redesign their inter-organizational business connections. Shared digital knowledge can be data that has been gathered from own processes or from platforms that are in broader use. Considerations of the strategic advantages and benefits that can be achieved must be established. The fifth level is business scope redefinition. The redefinition of the business scope means that the companies must assess what kind of changes must be done due to new technology. Since the old processes and capabilities have been altered, it is necessary to assess whether to outsource, modify or widen some functions. This process may also require establishing new services, partnerships, and strategies (Venkatraman, 1994).

On a global level, large-scale ports like those of Hamburg and Rotterdam have already started renewing their businesses to match the modern-day time as explained by Venkatraman (1994). Port of Hamburg (2017) has started their first fully automated reefer container monitor, meaning that the supervising of the incoming and outgoing container traffic is fully automated. It has already reduced work intensity and documentation input. The authorities in Germany decided to start the smartPORT logistics project in 2010 in the port of Hamburg. The target of the project was to improve the movements and timing of the cargo flows and the transportation methods that are used with investments in the port infrastructure and new information program. The basic logic was to combine the control of all transportation measures into a specific control center which enables make more agile decision-making and better communication with the incoming traffic. The decision-making is based on real-time data that is gathered from the drivers on the way (Heilig, Schwarze & Voss, 2017).

1.3 Opportunities and Values of Port Digitalization

Digitalization confronts the original and traditional way of competition and value building; business processes are heading more and more for networks and platforms (Zott, Amit & Massa 2011). All kinds of networks and platforms are a big part of digital ecosystems (Komulainen, 2016). Digital ecosystems are platforms that contain and bind all the sources and activities of the company together. Most importantly, since the goal of digitalization is to maximize the use of all layers in the business and creating value with choices that benefit the port and their customers, new operations can be created and powered through digitalization (Port of Kotka, 2016). The following are the opportunities and values that digitalization presents to the ports.

Digital access for customers: Electronic transactions like e-commerce, online retailing and digital marketing are widely used by companies (Zott, Amit and Massa 2011). Pires and Aisbett (2003) claimed that using e-commerce will improve the business in several ways, for example: better customer satisfaction and customer service, higher sales and though that higher revenue, a better customer relationship and improving in adopting new possible market areas.

Automation of business operations: Automation's role in ports has grown and the automated operations target to take full usage of the space that is in the port yard and hangars. Ports try to maximize the usage of different equipment and minimize errors and costs with the digital equipment. Most areas are in a symbiosis with digitalization meaning that humans work together with machines to achieve better results. Cargo handling has benefitted the most out of digitalization and automation (Merikotka, 2014). An automation is either full or partial and aims to increase flexibility and productivity to achieve the desired efficiency level. Operations like handling and storing can be automated through machines as well as development and production surveillance (Thulesius, 2016). Järvinen and Taiminen (2016) demonstrated that the use of automation in marketing demonstrated quality sales leads by targeting and personalization the content to certain behavioral groups.

Use of sensors and receivers to gain real time data: Sensors and receivers changed the way data is collected from the processes. It also created new business opportunities. Data can be gathered from several sources and not only from machines. In the modern time data is gathered also from tablets, customer platforms and other electronic devices. With today's analysis capabilities, it is possible to analyze the data in real time which makes possible to act in certain situations fast. In

logistics, it is possible to react on traffics and make a new route plan for the incoming or outgoing cargo traffic (Thulesius, 2016). It is important for business operators like ports to be able to react and change the plan swiftly to avoid conflicts and ensure the wanted outcome. It is important for the fluent cargo flow to have these sensors and it helps the port operators to maximize the usage of their assets available. In addition, the data that is gathered and monitored in real-time helps the customers to arrange their schedules accordingly (Järvinen and Taiminen, 2016).

Overview of cargo flow: Cargo that is transported without changing containers and with more than two transport ways is called intermodal transport. The target of this type of transportation aims to ensure an unbroken, reliable and the fastest possible transportation from the beginning to the end. Intermodal transport targets also to use each transport ways benefits to achieve fluent cargo flow (Thulesius, 2016). The cargo can be streamed smoothly, and the management can aim for higher accuracy in the cargo transportation (Haraldson, 2015). Digitalization makes it possible to overview various cargo flows from several sources and helps to channel them efficiently without interruptions.

1.4 Threats and Challenges in Port Digitalization

Despite all the opportunities digitalization process presents to the port, there are still risks in starting the digitalization strategy. This problem might occur even bigger for smaller companies because of lack of resources and usable assets. On the other hand, for larger companies and mega-corporations, the challenge lies in the fact the change is so enormously that it ends up affecting all their business processes. This impacts the port industry especially because there are so many processes that are impacted but internal and external sources (Thulesius, 2016). Some of the major challenges are:

Comprehensive and consistent digital strategies: It is important to have a key strategy to understand the outline of the project. Wrong and inconsistent strategies can lead to waste of efforts and resources. The strategy plays a key role when a company is entering a digital process. It is important to analyze and evaluate the ongoing and existing IT systems and their competitive potential before the company decides to invest in a new IT process. To understand if the ongoing technology can be used to benefit the technology that is desired can save a lot of time and assets that can be used otherwise (Haraldson, 2015). It is important to analyze and evaluate the ongoing

and existing IT systems and their competitive potential before the company decides to invest in a new process. It is important to understand if the ongoing technology can be used to benefit the technology that is desired (Haapala, 2010).

Expertise: Expertise is the key to a good strategy to guarantee a wanted outcome of the project. "Ports require experts like computer scientists, mathematicians, and data scientists having a solid foundation in modeling, analytics, statistics, and software engineering" (Heilig, Schwarze & Voss, 2017, p.1349). The port operators need this kind of experts to carry out digital projects and they can often be required from outside consultants. Nevertheless, it is also important to have knowledge about the port environment and operative functionality. You cannot just implement new technology on the basic knowledge that his worked in the mining industry.

Acceptance: Having acceptance from all involving parties and the port community when entering a new process. The challenge usually does not stop at the end of the process. Often at a concluded process, you need to watch and analyze how the implementation is going and check to see if it creates the intended value (Heilig, Schwarze & Voss, 2017).

Matching demand: One of the biggest challenges for the port industry is that the vessels are growing and carrying more cargo than ever. Also, the number of incoming vessels that carry cargo is raising up and these are most likely the biggest challenges the ports facing globally (Thulesius, 2016). The ports are seeing shipping companies improving their vessels in the matter of size and spacing. This means that the vessels not only are going to be larger but they are going to be also stored more efficiently so they contain more cargo. The ports have to be ready to unload even bigger amounts of cargo at the right time, which puts pressure on the infrastructure of the port yards. The need to increase yard productivity is big due to increasing amount of incoming cargo, which has led to peaks during the shipment arrival (Haapala, 2010). Not being able to match the demand of the shipping alliances in the efficiency could threaten the entire business of ports. This is where analytics and monitoring bring its value. Through the automation and analytical benefits, a port is able to time the arrival and prepare for the incoming cargo.

Safety: The threat of failing in matters of safety could easily reduce the interest of customers and end up in severe financial losses. Unfortunately, ensuring the safety of the employees, customers, equipment as well the goods has led to an increased number of automated processes and

application of more process surveillance technologies (Thulesius, 2016, Heilig, Schwarze & Voss, 2017).

Labor Union: The threat of losing jobs to automation has not pleased the unions whose activities sometimes paralyze the entire port. The last significant strike by the stevedores in Finland ended up shutting down 70% of Finnish foreign wood trade. The Finnish wood industry estimated that every day export goods worth 30 million euros were lost due to the strike, but the amount is hard to estimate because it depends on the angle it is counted (Haapala, 2010).

1.5 Port operations in Estonia and Finland

Estonia has been also a country to implement digitalization. Since the year 2000 internet access has been a right for every citizen. Also, in 2008 Estonia was the first country in the world to launch an E-healthcare system (Buhr, Frankenberger & Ludewig, 2016). Finland was in a Digi Barometer analysis of the 3 out of 22. The Digi barometer study analyzed readiness, utilization, and impacts of digitalization in the private sector and public sector (Kuusisto, 2014). As earlier explained the ports of Tallinn, Helsinki and Turku are important economic drivers for Estonia and Finland. The Helsinki - Tallinn route is also a major voyage route commuting with around a million passengers annually.

There are eight (8) ports in Estonia, the biggest cargo terminal is Muuga port and the passenger terminal is in Tallinn. Port of Tallinn is further divided into four different port sections. There are also Kopli - Port of Tallinn and Paldiski - Port of Tallinn. All ports take at least minor amount of cargo but there are two container terminals both located in Tallinn that is the main port area in Estonia (Searates statistics center, 2018). Tallinn harbor is the biggest cargo and passenger port in Estonian soil (AS Tallinna Sadam, 2016).

The port of Tallinn is the biggest port complex and authority in Estonia. It is one of the busiest and biggest ports in the Baltic Sea region. Port of Tallinn is a state-owned company managing four different port sections (AS Tallinna Sadam, 2016). The total revenue of Tallinn's port complex was in the year 2016 almost 96 million euros. It is surprisingly much when we compare to Port of Helsinki where the turnover was 89.7 million euros.

Finland has 46 ports in Finland, this includes also the inland ports of Finland. The main ports of Finland are in Turku, Helsinki, and Kotka. Finland has three (3) container terminals which are located in Pori, Kotka and Helsinki (Searates statistics center, 2018). Port of Helsinki is the biggest port complex in Finland. It is also one of the biggest ports in Northern Europe. As the port of Tallinn is stated owned so is port of Helsinki. Port of Helsinki is owned by the city of Helsinki (Port of Helsinki, 2016). Other mentionable ports in Finland where the Port of Turku with 22 million and HaminaKotka Satama Oy with 35.8 million euros' turnovers. It is also mentionable that HaminaKotka mainly focuses on cargo since it is one of the three container terminals.

Conclusion

This chapter discussed how important digitalization is and how ports can benefit from it especially with the right people. It also showed that digital processes can bring financial savings and improved business operations with the wanted efficiency level. It concluded by showing the importance of the Estonian and Finnish ports are both implementing digital equipment.

2 METHODS

2.1 Research philosophy

According to strategic management theory, the management level and their impact on the process is the lifeline to success, companies must be innovative when they are entering a new process. Noble stated (1999b) that even the best planned strategies might fail to generate good results if they are not implemented successfully (Guohui, S, & Eppler, M. J., 2008, p.3). They noted that even the best strategy on paper might end up being a disaster if not properly executed. When a company decides to invest in the digitalization process, it is important to have a well-planned strategy along with good leadership.

Redefining a company's strategic view is the first step in business transformation. It includes redefining capabilities, goals and competences to achieve the advantage on the market (Bowersox, Close & Drayer, 2005, p. 2). Guohui and Eppler (2008) explained that implementing a strategy has risen up as one of the biggest challenges the management has to face, and this implies all industries. Their study showed that there is a big risk of failure in new strategical change. This is why it is critical to have the key people organizing the change so that the project results will be positive.

Kong (2007) Stated that strategy is the balance in a company between actions and choices as well as internal abilities and external surroundings. Kong said that strategy must be combined with overviewing external and internal preferences, behaviors, processes and environments of the company. Guohui and Eppler (2008), said the strategy is a series of decisions, choices and activities which might be complex or simple, are impacted by all employees from the top-level managers to the lower level employees and also by the internal and external components. By looking the strategy this way, the companies are able to achieve their targets and turn the strategic plans into reality.

2.2 Research design

The questions were targeted accordingly to answer the main research questions. This study was conducted accordingly to a qualitative framework, because it was the most suitable way to explain the impact of the digitalization in the Gulf of Finland I where the biggest ports of Finland and Estonia are located.

The interview questions were concluded of four open questions which covered the impacts, the threats, the targets and the future opportunities of digitalization.

2.3 Sample selection

The sample selection for this study were people who work in the port industry or are closely related industry. In addition, this study aimed to interview people from the ports who are closely connected with the digital processes or are involved in decision making about new technology and processes that are influenced by digitalization. A total of six respondents were interviewed for this study, from which two were conducted in person and four of them were carried through via Skype.

Interviews were made in an understanding with my professor from Tallinn University of Technology. The interview questions were piloted by my coworkers and by my former manager. The questions were targeted accordingly to answer the main research questions.

3 RESULTS AND DISCUSSION

3.1 Results

There were six respondents. All respondents work closely with the port industry and the digital environment. The respondents are familiar with the digital processes that are ongoing in the ports. The respondents are mainly working with ports that are located at the Gulf of Finland. The respondents from Finland had a working experience of over 15 years in the maritime and port industry. All the respondents from Finland were also involved in decision making in ports and were higher level managers. The Estonian respondents did not have as many years of experience in the industry. The Finnish respondents worked in the field of IT managers and operative managers.

The respondent A_3 had the most experience in the industry of maritime and it was over 10 years. A_3 was involved in the decisions making process and worked in traffic managing. The respondents A_1 and A_2 had around 5 years of work experience in the ports and maritime industries. A_1 was working as a freelancer to improve the digital solutions for the ports and A_2 is currently working as a professor but works closely with the Estonian ports. They were not working in currently straight for the ports but were involved in operations in which the port complex of Tallinn was also involved.

This table presents what the ports in Estonia and Finland are trying to achieve through digitalizing their operations and what it means to them.

Table 1. What does digitalization mean to you and your port and what are you trying to achieve through digitalization?

Respondents	Responses
Category A (Estonian, Tallinn)	
Respondent A_1	Acquiring savings and visibility in processes. Improved communications and data exchange.
Respondent A_2	Management - and information flow, savings, improved operative planning and functionality.
Respondent A_3	Improving in communication and data exchange and improve yard usage. Efficiency improvements and savings are also looked for. Trying to improve the incoming and outgoing traffic.
Category B (Finland, Kotka, Helsinki)	
Respondent B_1	Improving business operations, communication and impact on the customer satisfaction. Savings in several fields and improved efficiency in operations.
Respondent B_2	Savings in resources, staff and electronic cargo flow documentation. Efficiency improvements. Supervising overall operative processes in ports.
Respondent B_3	To improve overall functions in the port. Better data handling and exchange and communication. Improved efficiency and more efficient logistic sector.

Summary

Category A
- All of the respondents in Category A stated that they are looking for financial savings from digitalization.
- The respondents said that ports are trying to achieve better communication between all parties that are involved in the processes.
- Respondent A_3 stated that they are looking for efficiency improvements in ports operations through digitalization.
- Improving the coming and going traffic.

Category B
- The respondents in category B said that they are looking for savings through digitalization. Savings are achieved in work hours and resources.
- The respondents stated that their port operators are looking for efficiency improvements through digitalization.
- Respondents told that they are looking to improve the overall business operations and their functionality through digitalization.
- Also, an improved logistic sector.

Digitalization is seen as a useful tool that aids the ongoing operations and improves them. The respondents stated that they are looking to achieve financial savings through the improvements digitalization offers them.

The respondents from both countries stated that they are looking for better communication between parties that are involved. The better communication includes also the customs duty who is present in the ports. The respondents stated also that they are hoping to achieve a better operative functionality especially in cargo handling but also in the passenger traffic. The respondents stated also that they are expecting more accurate and faster data exchange that can be seen by all parties.

This table presents how the ports of Tallinn, Helsinki, and Kotka have benefitted from digitalization this far.

Table 2. How has digitalization affected your company?

Respondents	Responses
Category A (Estonian, Tallinn)	
Respondent A_1	Financial savings are already achieved in several fields. Better planning and visibility has led to less mistakes. Improved communications between involved parties.
Respondent A_2	Information flow is faster and more accurate between necessary parties. A more error free environment through improved communications.
Respondent A_3	Improved relationships and communication with all parties involved. Real time visibility of ongoing cargo and movements in the port area. Electronic data transfer between parties improve efficiency.
Category B (Finland, Kotka, Helsinki)	
Respondent B_1	Automated check in processes for passenger traffic and for cargo traffic. Less staff due to automated processes and improved access control for cargo flow. The amount of investments in digitalization has been around 4% of revenue in 5 years. Customers value investments in digital processes.
Respondent B_2	Real time information for customer's goods whereabouts. The yard technology works fully and improves operations functionality. Web services that improve access for operations. Investments have been around 4-10% from the revenue in five years. Less employees nowadays and twice the amount of cargo. Customer demand digital processes.
Respondent B_3	Mobile port applications to control the coming and going traffic. Electronical billing system and automation of cranes and processes. Better data exchange between parties. Improved efficiency.
Summary Category A - Respondents stated that digitalization has made the ports already more error free. - Communication has improved and is more accurate and faster between all parties involved in the transaction. - Some financial savings have already been achieved through automation and improved communications which has led to efficiency improvements. - Real time visibility and data of cargo flow for the parties involved in the action. Category B - Automated data about the ongoing cargo traffic and their locations. - The investment level in digitalization is over 4% of the revenue in 5-year time frame. - Less employees due to automation of processes. - Web services and mobile applications impact the operations surveillance and help to handle the coming cargo or passenger traffic. - Customers want that the port operators invest in digital processes to improve their operations.	

All the respondents said that the impact of digitalization can already be seen. Digitalization has already changed the working environment towards more automation and through that to a more efficient work environment. Also, the rate of mistakes has reduced due to automation of processes.

The respondents stated that the data exchange between all necessary parties has already improved but there still is work to be done. The data can be shared through several channels and all involved in the process are able to see the progression of the action.

Different web and mobile applications help the ports and their customers to time their cargo and passenger movements. It helps also the cargo owners to time their arrivals which makes the environment more efficient. The customers were said to appreciate and value the mobile applications that help passenger traveling in ports, but the cargo traffic demanded working environment that is supported by web and mobile applications to withstand the growth of demand in the business.

This table illustrates the threats that digitalization has brought or could possibly bring to the industry in the future.

Table 3. What type of threats do you think digitalization process has brought or can potentially bring to your ports?

Respondents	Responses
Category A (Estonian, Tallinn)	
Respondent A_1	Digital service providers sell same package for several fields without changes. How to get all involved parties to work together and share sensitive information.
Respondent A_2	Actors involved in the process do not trust each other with sensitive data, so it is not shared. Cyber-attacks oppose a risk for sensitive information.
Respondent A_3	Data protection problems. Parties involved are not willing to share sore information. How to get all parties to use new technology when the old still works. The way of doing thigs is going to change. Cyber-attacks of sensitive data.
Category B (Finland, Kotka, Helsinki)	
Respondent B_1	On the stevedore side the unions are troubling. Big financial investments so the risks are high. How to apply new ways of working.
Respondent B_2	How to control the coming changes. How to change the entire way of working and doing. How to apply new methods and strategies.
Respondent B_3	Processes are changing so quick how keep up. Capacity problems, how to maintain the coming and outgoing data and goods. Data security! Big fine if the port commits data protection crime!
Summary Category A - Involved parties in the port operations are not willing to share sensitive data with each other. - Cyber-attacks oppose a big risk for the sensitive data that is handled in ports. - How to get all parties use the new technology and change the way of working. Category B - How to apply the new ways of working which digitalization makes possible. - Challenge is going to be how to control the all coming changes and how to apply new strategies. - Respondent B_3 said that data security is a threat. Finland has strict policy in data protection crimes. - Capacity problems in handling more cargo and data. - On the stevedore side the unions can be problematic.	

All respondents mentioned some issues digitalization can possibly create. The main issues digitalization creates are in the field of data security. The question is how to protect yourself from cyber-attacks and leaks when a significant amount of sensitive data is gathered. Finland has a strict policy in the field of data protection crimes.

The respondents stated also that when digitalization impacts the way of doing how to apply new ways in an industry that has worked with the same habits for decades. Also, how to handle and maintain the changes of the increasing amount in cargo and data. Every respondent said that digitalization brings more benefits to the industry than it creates threats.

Respondent A_1 stated that the service providers from whom the ports usually buy the newest technology or use their help in consultancy, tend to sell packages that are not customized.

Table 4 presents what the respondents see digitalization can offer for the ports in the future or makes possible.

Table 4. Are there any new business opportunities that digitalization makes possible?

Respondents	Responses
Category A (Estonian, Tallinn)	
Respondent A_1	Faster and more accurate logistic services. More customers due to availability of services and saved time. More flexible and cost effective.
Respondent A_2	Better flexibility in overall operations. Supervising better the outgoing and incoming traffic from all customer bases. Improve security systems for data and yards.
Respondent A_3	Automated check in systems for logistics so that the whole process would not need support. Communication between parties so that the unnecessary steps are cut out. To integrate security systems of the ports and clients in the port areas.
Category B (Finland, Kotka, Helsinki)	
Respondent B_1	Automated guidance systems for cargo flow. Mobile app development to improve the timing of the cargo and passenger traffic. Bring together every function and operation that takes part in the action.
Respondent B_2	The amount of data that is gathered is huge, how to handle it and benefit out of it. Working from a distance is coming more popular, cost effective and useful. Automation of all cranes and equipment. Automated information sharing can be provided of the goods while on the way.
Respondent B_3	More efficient, faster and better services. Ports could be data companies. A lot of data could be sold on for third parties to benefit financially.
Summary Category A • Over all better flexibility to improve the operations. • Improving the security measures of the yards and data. Also, to get all parties involved to use same security measures. • Improve the supervision of the ongoing actions for cargo and passengers. • Automation of logistic services to ensure faster and accurate outcome. Category B • Automation of the cargo flow and to enable information sharing while on the way. • Automation of the cranes and different equipment. Remote access to supervise and move the cranes if necessary. • How to handle the data that is gathered from the process and how to benefit out of it. • Mobile apps to support the coming and outgoing traffic. • Uniting all actions in a certain operation.	

All the respondents said that digitalization is going to keep creating opportunities in the future. New business opportunities were seen in the cargo field in the means of the increased amount that can be handled and the accuracy of the moved cargo. The yard and terminal control are going to be fully automated in the future, so the efficiency is going to increase even more. The automation of the yards allows also a better overview of the processes that are ongoing in the yard.

One new interesting opportunity was raised what ports have not been doing was reselling the gathered data from the processes. The ports gain huge amounts of data of the ongoing traffic around which could be resold for local businesses to gain extra revenue.

3.2 Discussion and Recommendations

Digitalization was not seen as a new phase or process but as a useful tool that supports the ongoing operations on the yard as well in the terminals. Digitalization offers a lot of potential improvements to the port industry all the way from better communication with the involving parties to an increased amount of handled cargo. The core improvements were to reduce the overall costs in all fields and through automation and better technological systems to increase the efficiency in Finnish and Estonian ports.

The automation of the processes is going to eventually improve the overall operative functionality of the ports. Automation is going to lead towards fewer mistakes in the ports and to a more efficient working environment. One benefit of automation is that most of the equipment and cranes can operate themselves but those which cannot, can likely be moved and accessed remotely. It was stated by the respondents from Finland that they have less staff than 10 years ago but they handle twice the amount of cargo. A job that used to require 5 men can be done by one who is not even present in the port. The automation of processes is going on already in the port sector in Finland and Estonia and it is going to take over eventually all of the functions that can only be taken over.

In the future automation could also be maintained by artificial intelligence. The processes are going more and more towards full automation, so it could be an extremely cost efficient solution

to acquire artificial intelligence to maintain the simple processes in the start and when the technology evolves it could take over more complex operations.

One of the main improvements the respondents were expecting was data exchange between parties that operate in the Finnish and Estonian ports. How to get all share the necessary data with the right authorities and partners as quickly as possible. This can most likely be achieved with different kind of web and mobile applications that are accessible for the involving sides. The ports of Tallinn and Helsinki have started to plan a mobile app to improve the passenger traveling and are thinking on extending it to the cargo traffic also. The customers are going to demand more digital access to buy and clarify the service they want to use and therefor it is key things the ports of Kotka, Helsinki, and Tallinn need to develop.

Port of Hamburg started a project in 2010 where they centralized the communication of all transportation ways so that the decision making would become more agile. This way the communication and data sharing would go through one place and it would become more efficient and it would visibility since everyone would use the same channels of communication and data sharing. This is something the Finnish and Estonian port industries have been trying to achieve through a single window program and partly it is working. The program is nationwide in it was created by EU.

Digitalization offered also one relatively new business opportunity for the ports. Its core idea is to resell the data that is gathered from the processes. Ports operate huge amounts of data about different types of goods that could be resold and through that could be gained more revenue. This idea was presented by one respondent from Finland, but he stated that the idea is new and still under a thinking cap. This is most likely a business idea where the ports in the Gulf of Finland would need outside consultancy since the core business of ports is not data handling.

Digitalization creates a certain type of threat to the data that is shared. One reason why companies working in the ports and shipping through might not be willing to share data is that they cannot afford the data to leak forward. The cyber-attacks create a significant threat to all data that is shared and handled online. The respondents from both countries said that they have seen attempts of cyber-attacks and phishing. Therefor it is crucial to keep up to date the firewalls and have measurements that certain data needs to be encrypted. This could also be something the ports consider outsourcing.

The customer benefits from most digital improvements in the means of faster and more accurate delivery. The respondents from Finland and Estonia stated that the passenger who travel appreciated a lot the digital option to check in and to pay. On the cargo side where the impact is larger, the customer did not only value digital and technological improvements but especially in Finland they demanded that the port sector keeps improving their functionality and through their functionality improvements their operations improve in the ports also.

The operators could do give a picture of the profits gained form digitalizing since every project is evaluated by itself and the time frame for the evaluation can be long. Respondents stated from both countries that the profits are remarkable but did not want to mention any sums because there was no certainty about them.

The ports in Finland and Estonian will keep adopting new technologies and software to improve their operations, to ensure the growth of the revenue and to ensure the customer satisfaction. Without the digital improvements, the ports will never be able to match the demand of future. Briefly, the digital implementations were seen as an overall benefitting resource.

CONCLUSION

4.1 The aim of the thesis

The aim of this paper was to analyze the opportunities and threats that are created or achieved through digitalizing processes in the port industry. The study aimed to answer these questions of the ports that are located in the Gulf of Finland in Estonia and Finland.

The primary target was to investigate if digitalization creates new business opportunities and improves the ongoing operations in the ports. Creating new operations and improving the old does it create more value for the ports. The other primary target was to study does digitalizing the processes create possible threats to the industry.

4.2 List of the conclusions

Digitalizing the operations in, the ports do offer more opportunities than it creates threats. This study found out that there are numerous opportunities and improvements that digitalizing the port operations makes possible.

All of the respondents applied in the study that digitalizing the processes will lead towards better functionality in the port industry. The better functionality will be achieved by automating different processes all the way from electronic registration systems for passengers in the terminals to automation of the cranes which move the cargo in the yard. Automation will eventually lead to a more error free environment which will be more efficient and reduce the level of costs.

But in the end the core targets are to reduce the costs and improve the overall functionality of the operators by increasing the level of communication, automation and improve the data exchange between parties involved in the actions. The core opportunities in the port industry are going to be in the future still around the handling and movement of the cargo. EFIP stated in their research 2017 that if the ports simply fall behind in the digital development they will not be able to compete in the modern environment of business.

There were some new kind of business opportunities which can be powered through the digital progress. One of the most beneficial new opportunities goes around the gathered data and about the opportunity to resell it to a third party. This could be a major new business opportunity for the port operators since the data they gather could benefit local business to increase their revenue. But this kind of opportunity would need core expertise, so the business function could be outsourced to a level that is more knowledge about the function.

New business opportunities occur also in the field of digital customer access. The ports are creating new channels to distribute their services. Digital customer accesses have already been started in the field of supervision of the product life cycles and distribution of ports services. All services that are in the web or on the mobile phones are going to increase the level of interest in the customers since the services are easily accessible.

The automation of logistics is also in the future opportunities. The core idea could be that the flow of the cargo is supervised from a distance control room. All functions happening in certain time and place in the ports would send information to the control center and which could necessarily react oncoming changes and reroute or reschedule.

Mainly digitalizing processes did not create risks in the port industry. The risk that might occur in during digitalizing processes or implementing them is more or less in the sector of data protection area. How to ensure that the shared and gathered data does not end up in the wrong place. It came up in the interviews that for sensitive data there are protections that are required in emails and messages to minimize the risk of the data ending up in the wrong place.

4.3 Assessments and proposals

Future research studies could consist the themes of the usage of artificial intelligence in automation processes to benefit the ports in the Gulf of Finland. Most of the processes work and function by themselves how will it change when they are capable to make the decision by themselves and give instructions. This could possibly be a significant opportunity for the ports located in southern Finland and in Northern Estonia. Since artificial intelligence is a very recent and continuously evolving technology it has not been piloted in many ports.

Also, the cyber-security side of the ports. When the amount of sensitive data that is gathered is vast it raises the question how to maintain it all secured. One research option that could benefit the port industry widely is how the industry could benefit from the data that is gained from the processes. This could be a research topic that the ports are already thinking about and hoping to get some instructive answers. The Finnish ports are looking for options in the data handling business and mapping opportunities in the sector.

LIST OF REFERENCES

Aaron Levie, the CEO of Box (2016)

AS TALLINNA SADAM, Consolidated annual report, (2016)

Bowersox, D. J., Closs, D. J., & Drayer, R. W. (2005). The digital transformation: technology and beyond. *Supply Chain Management Review*, 9(1), 22-29.

Buhr, D., Frankenberger, R., & Ludewig, A. (2016). *On the Way to Welfare 4.0 – Digitalisation in Estonia.*

Clive Humby, *UK Mathematician and architect of Tesco's Clubcard*, 2006

Corniani, M. (2006). *Digital marketing communication*.

Chesbrough, H. (2010). Open services innovation: Rethinking your business to grow and compete in a new era. John Wiley & Sons.

DiViA 2014. *Digitaalisen markkinoinnin barometri* 2014*, Aalto University Executive Education Oy ja Scan Kyselypalvelut. s. 1-10.*

European Federation of Inland Ports- Inland Ports- Digital hubs in intermodal logistics*, (2017)* Accessible*,https://www.inlandports.eu/media/Position%20paper%20on%20digitalisation%20and%20inland%20ports%20(11-04-17)-2.pdf, 1 March 2018*

Guohui, S., & Eppler, M. J. (2008). Making strategy work: A literature review on the factors influencing strategy implementation. *Handbook of Strategy Process Research, 252-276.*

Haapala, T. (2010*). Mistä puhumme, kun puhumme ahtaajien lakosta?: Kevään 2010 ahtaajien lakon uutisointi Helsingin Sanomissa ja Yleisradiossa.*

Haminakotka Satama Oy- Konserni, Toimintakertomus ja tilinpäätös*, (2016). Accessible: http://www.haminakotka.com/sites/default/files/attachment/Tilinp%C3%A4%C3%A4t%C3%B6s%202016.pdf*

Haraldson, S. (2015*). Digitalization of sea transports–Enabling sustainable multi-modal transports.*

Heilig, L., Schwarze, S., & Voss, S. (2017*). An analysis of digital transformation in the history and future of modern ports.*

Ivang, R., Rask, M., & Hinson, R. (2009). B2B inter-organizational digitalisation strategies: Towards an interaction-based approach. Direct Marketing*: An International Journal, 3(4), 244-261.*

Järvinen, J. & Taiminen, H. 2016. Harnessing marketing automation for B2B content marketing. *Industrial Marketing Management 54 (2016) 164–175.*

Komulainen, M. (2016). *NEW BUSINESS MODELS AND IGITALIZATION IN MICRO FIRMS AND SMES.*

Kong, E. (2007). A review of the strategic management literature*: The importance of intellectual capital in the non-profit sector. In Proceedings of the 28th McMaster World Congress. McMaster University, DeGroote School of Business.*

Koskinen, P., Rautiainen, P., & Rinta-Keturi, I. (2010). Sataman informaatiokeskus ja sen rajapinnat*. Turun yliopiston Merenkulkualan koulutus-ja tutkimuskeskuksen julkaisuja, B, 179.*

Kotler, P., Keller, K. L., & Brady, M., Goodman. M. & Hansen, T. (2009). *Marketing management. European ed. 1st ed. Pearson/Prentice Hall. Upper Saddle River, NJ.*

Kuusisto, J. (2014). Smart Services and Digitalization: Challenges and Opportunities Ahead−The Case of Finland. *Dienstleistung in der digitalen Gesellschaft: Beiträge zur Dienstleistungstagung des Bundesministeriums für Bildung und Forschung im Wissenschaftsjahr 2014, 190.*

Lipiäinen H. & Karjaluoto H. 2015b. Industrial branding in the digital age. *Journal of Business Industrial Marketing, Vol. 30 Iss 6 pp. 733 – 741*

Merikotka, 2014*, Digiport.* Accessible*: http://www.merikotka.fi/projects/current-projects/digiport/,* 20 March 2018.

Murnane, J., (2017), *Ports and shipping, The need for solutions that cross line.* Accessible*: https://www.mckinsey.com/industries/travel-transport-and-logistics/our-insights/ports-and-shipping-the-need-for-solutions-that-cross-lines,* 15 March 2018

Ng, A. K. Y. (2009). Competitiveness of short sea shipping and the role of port: the case of North Europe. *Maritime Policy & Management, 36(4), 337-352.*

Port of Hamburg (2017). First fully automatic reefer container monitoring implemented at C   Steinweg (Süd-West Terminal) in Hamburg. Accessible: *https://www.hafen-hamburg.de/en/news/first-fully-automatic-reefer-container-monitoring-implemented-at-c-steinweg-sued-west-terminal-in-hamburg---35187.*

Port of Helsinki*,* Annual report*,* 2016

Port of Turku*,* Annual report, 2016

Porter, M. 2001. Strategy and Internet. *Harvard Business Review. March 2001.*

Rajala, R., Westerlund, M., & Möller, K. (2012). Strategic flexibility in open innovation−designing business models for open source software. *European Journal of Marketing, 46(10), 1368-1388.*

Ross, B. (2015). Why 40 Percent of Businesses Will Die in the Next 10 Years. [online] Ross & Ross International. Accessible: *https://www.rossross.com/blog/40-percent-of-businesses-today-will-die-in-10-years* [Accessed 15 May 2018].

Sea ports of Estonia, (2018), Accessible: *https://www.searates.com/maritime/estonia.html*

Sea ports of Finland, (2018), Accessible: *https://www.searates.com/maritime/finland.html*

Slater, S. F., & Olson, E. M. (2001). Marketing's contribution to the implementation of business strategy: An empirical analysis. *Strategic Management Journal*, *22*(11), 1055-1067.

Stadler, R., Brenner, W. & Herrmann, A., 2014. How to Succeed in the Digital Age. *Frankfurt am Main: Frankfurter Allgemeine Buch.*

Tammepuu, A., Tammepuu, O., & Sepp, K. (2009). Emergency preparedness in integrated management systems: case study of the Port of Tallinn. *WIT Transactions on The Built Environment*, *110*.

Thulesius, M. (2016). Digital Transformation of Ports: *A Status of the Port of Hamburg and the Port of Singapore.*

Venkatraman, N. (1994). IT-enabled business transformation: from automation to business scope redefinition. *Sloan management review*, *35*(2), 73.

Westerman, G., Calméjane, C., Bonnet, D., Ferraris, P., & McAfee, A. (2011). Digital Transformation: A roadmap for billion-dollar organizations. *MIT Center for Digital Business and Capgemini Consulting*, 1-68.

Yoo, Y., Lyytinen, K. J., Boland, R., & Berente, N. (2010). The Next Wave of Digital Innovation: Opportunities and Challenges: *A Report on the Research Workshop 'Digital Challenges in Innovation Research'.*

Zott, C., Amit, R., & Massa, L. (2011). The business model: recent developments and future research. *Journal of management*, *37*(4), 1019-1042