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Digitalization of forwarding- & delivery process

Action research for forwarding at ABB Oy

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ABSTRACT :

Digitalization and digital transformation have long been in the minds of companies and the entire business world and have increased their relevance in relation to new regulations, laws, and environmental issues. For this reason, most companies strive to move their practices towards new standards to keep up with the ever-changing operating environment in terms of customers' wishes and to keep up with the competition. Outdated operation methods are constantly updated, and companies invest more and more in sustainable development than ever before. The various functions of the companies are going through changes, which aim to influence the overall image of the company. For this reason, the goal of this research is to take the freight forwarding process of the commissioning company through digitalization, and to update the already outdated operating methods, especially regarding paper prints.

The theoretical reference framework of the research is built from a strategic point of view, going through the perspectives of what companies want to achieve with digital change, what are its challenges, levels, and effects both in terms of technology and the environment. The theory thus supports the process itself and its results.

The empirical part of the research was created based on action research, because during the research the researcher was involved in the changes and monitored the feedback and development proposals received, thus contributing to the quality of the changes. Traditional interviews were not carried out in the research, but the results of the research are based on the discussions, feedback and meetings that took place during the research process.

Thanks to the research, the forwarding process, as well as the supporting functions, processes and tools surrounding it, were significantly improved, affecting the number of paper prints, the lead time, and the simplicity of the process itself. The development targets and changes observed during the research were so significant that they could be utilized in other units of the commissioning company, making their impact even greater.

Since it can be said that digitalization and digital transformation are never finished, the process in the different functions of the commissioning company continues even after this study in terms of new ideas and development targets. The biggest of these issues can be mentioned the wishes of different customers regarding physical copies of invoices and their necessity.

KEYWORDS: digitalization, digital transformation, forwarding

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TIIVISTELMÄ :

Digitalisaatio ja digitaalinen muutos ovat jo pitkään olleet yritysten ja koko yritysmaailman tietoisuudessa ja nostaneet merkityksellisyyttään uusien säännösten, lakien ja ympäristöasioiden suhteen. Tästä syystä, useimmat yritykset pyrkivät viemään toimintatapojaan kohti uusia standardeja pysyäkseen mukana alati muuttuvassa toimintaympäristössä asiakkaiden toiveiden suhteen sekä pysyäkseen kilpailussa mukana. Vanhentuneita toimintatapoja päivitetään jatkuvasti, ja yritykset panostavat yhä enemmän kestävään kehitykseen kuin koskaan aikaisemmin. Yritysten eri toiminnot käyvät läpi muodonmuutoksia, joilla pyritään vaikuttamaan koko yrityksen toimintakuvaan. Tästä syystä, tämän tutkimuksen tavoitteena onkin viedä toimeksiantajayrityksen huolintaprosessi digitalisaation lävitse, ja päivittää jo vanhentuneita toimintatapoja, erityisesti paperitulosteiden suhteen.

Tutkimuksen teoreettinen viitekehys on rakennettu strategisesta näkökulmasta, käyden läpi näkökulmat sille mitä yritykset haluavat tavoitella digitalisella muutoksella, mitä ovat sen haasteet, tasot ja vaikutukset niin teknologian kuin ympäristönkin suhteen. Teoria täten tukee itse prosessia ja sen tuloksia.

Tutkimuksen empiirinen osa on luotu toimintatutkimuksen pohjalta, sillä tutkimuksen aikana tutkija on samalla ollut mukana muutoksissa, ja seurannut siitä saatuja palautteita sekä kehitysehdotuksia, ja näin ollut osaltaan vaikuttamassa muutosten laatuun. Tutkimuksessa ei toteutettu perinteisiä haastatteluja, vaan tutkimuksen tulosten pohjana toimii tutkimusprosessin aikana käydyt keskustelut, palautteenannot sekä palaverit.

Tutkimuksen ansiosta huolintaprosessia, sekä sitä ympäröiviä tukitoimintoja, prosesseja sekä työkaluja saatiin parannettua huomattavasti, vaikuttaen paperitulosteiden määrään, prosessin läpimenoaikaan, sekä prosessin yksinkertaisuuteen itsessään. Tutkimuksen aikana havaitut kehityskohteet ja muutokset olivat osaltaan niin suuria että niitä pystyttiin hyödyntämään toimeksiantajayrityksen muissa yksiköissä, jolloin niiden vaikutus oli entistä suurempi.

Koska voidaan sanoa, että digitaalisuus ja digitaalinen muutos ei ole koskaan valmis, prosessi toimeksiantajayrityksen eri toiminnoissa jatkuu myös tämän tutkimuksen jälkeenkin uusien ideoiden ja kehityskohteiden osalta. Suurimpina näistä kohteista voidaan mainita eri asiakkaiden toiveet fyysisistä laskukopioista sekä niiden tarpeellisuudesta.

AVAINSANAT: digitalization, digital transformation, forwarding

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1 Introduction

Digitalization in companies, scholars, and countries has grown significantly due to its ability to ease up the transformation of data and information into more tractable version leading to an efficiency increase in production and working methods in companies and schools. Moreover, process digitalization can help companies in their decision-making and transform the process into more sustainable versions of themselves. (Klymenko, Lilbrygfjeld Halse & Jæger, 2021). Projects and efforts towards advanced digitalization increased massively due to COVID-19 pandemic which forced companies to find alternative solutions for operating models, which had been existing for years. Covid-19 is one of the main reasons why digitalization and digital transformation is and will be one of the major themes for organizations in the near-future. Covid-19 forced companies to thoroughly go through their operating models to have a chance against the changing environment. (Frankiewicz & Chamorro-Premuzic, 2020). Covid-19 also made digitalization and digital transformation take significant leap in a short period of time. The great leap in digitalization also raised possibilities. Companies may use the situation in their own benefit with customers, operating models, and operating systems to improve their performance. Shift in the markets meant changes in company strategies. (Klein & Todesco, 2021)

The way companies operate in the business environment is in constant motion in today's business life. Things that were relevant in the beginning of 21st century have already expired. Employers place higher value for upskilling and digital skills than to tenure and working experience. (Turner, 2022). However, employees are only one small part of this since digitalization and sustainability have created rising interest from companies and researchers due to changes in laws and operating models. Especially sustainability has transformed from a subject with small influence on a necessity in the business environment of today. Same applies to digitalization since both have a wide impact on businesses and their operations and might have a significant consequence from authorities and public if not applied properly. (Klymenko et. al (2021).

1.1 Motivation for the thesis

Digitalization has the ability to make companies gain an increased competitive advantage over their competition in a short period of time. This is why companies need to keep their competition and digitalization strategies constantly up to date in case other companies on the same business field come up with new operating models and solutions. Therefore, it is important to keep innovating and constantly enhance the way of working. (Wen, et.al 2022).

Digitalization increases the level of location independence in companies, which has wide impact within. For instance, productivity levels may rise since some workers are more suitable for home offices than others. Furthermore, travel costs, environmental impacts, and time used for travel will decrease while employee satisfaction will increase having an effect to the overall performance of each employee. (Nash, Jarrahi & Sutherland, 2020).

The importance of reducing environmental impacts from manufacturing companies has increased due to global warming and there is an increasing amount of legislation towards waste management and sustainability. Therefore, companies are seeking new ways to achieve the sustainability goals established by governments and leaderboards. Study by Lieb & Lieb (2008, 526) showed that most popular reason for new sustainability programs however in companies according to CEO's was "a corporate desire to do the right thing".

1.2 Objective of the study and research questions

Based on the issues stated, related to digitalization and policies leading to changes in strategy and operating models, this study has been created in the form of action research to fully study and implement findings of an actual company and its operations. The objective of this Master thesis is to examine the forwarding process through its challenges and possibilities to find out how forwarding process can be improved through

digitalization. To find solutions for the existing problems, the researcher will work alongside the research to improve the forwarding function in the commissioning company through observations, meetings, and discussions, and hence guiding the digitalization efforts in the right direction. The final objective is to alter the forwarding function through digitalization and achieve more effective and efficient forwarding function while also being practical for the employees working in that specific function. The goal is to achieve more time and place independent forwarding and simultaneously improve the lead time of the whole order-to-delivery process. As of now, employees working in the forwarding function are required to print and sign documents, such as invoices and packing lists, which is not necessary in today's digital world.

Digitalization of the forwarding function has number of motivational backgrounds, why the process must be seen through from the perspective of the commissioning company. Challenges, such as lack of resources, and low efficiency are among those companies are trying to solve. (Rosin, Proksch, Stubner & Pinkwart, 2020). Furthermore, digital technology, digital competition and digital customer behavior are driving companies to increase digital presence within their operations to match with the direction the markets are heading to. (Verhoef, Broekhuizen, Bart, Bhattacharya, Dong, Fabian & Haenlein, 2021). Moreover, digitalization is currently having a strong effect to the world of forwarding, and logistics which have a significant meaning to the operating model of the forwarding team in the commissioning company of this thesis. In addition, the necessity of human staff is often questioned in relation to increasing capabilities of digitalization and automation. Hence, manufacturing companies dealing with logistic companies, forwarding personnel and transportation in general are interested about the future with digitalization. (Bavrin, Koop, Lukashevich, Simakova & Temirgaliev, 2021). In a conclusion, could the digitalization of the forwarding team lead to a significant increase in the capabilities of the forwarding team, which could then lead to surplus of resources, instead of lack of them.

To solve the existing problems and improve the forwarding process, the research will answer to following questions.

1. *How digitalization affects the forwarding function inside order-to-deliver process in an international company?*
2. *What does it take to increase digitalization for forwarding in an international manufacturing company?*

The project is important for the commissioning company since the discussions of the same issues has been ongoing for few years. Especially when Covid-19 made companies rethink their ways of working, the commissioning company realized that the forwarding function cannot be done remotely. Furthermore, it's crucial to clarify that this research is concentrating more on digitalization, because this research is about the alteration and updating of the existing processes within the forwarding team. Hence, relating to the terminology of digitalization as "the use of digital technologies to innovate a business model and provide new revenue streams and value-producing opportunities". (Annarelli, Battistella, Nonino, Parida & Pessot, 2021). When in the other hand, digital transformation is concentrating more to the use of knowledge and integration of technology to most of the business areas inside a company. (Monton, 2022).

1.3 Structure of the thesis

This research consists of seven chapters. The first chapter is the introduction of the research. The introduction chapter consists of objective of the thesis and introduction of the research questions. Also, the motivational background for this thesis is introduced. The second chapter will present the subject from a theoretical background, hence justifying the research and the decisions made. The third chapter presents the methodology of this thesis, the research method used and how the quality of this thesis is assessed and questioned. The fourth chapter goes deeper into the actual commissioning company and presents their side of the digitalization process while revealing the order-to-delivery

process from their own perspective. Furthermore, the digital strategy of the commissioning company is presented which also forms a ground for the motivation of this study, as well as the findings made throughout the process.

In terms of the results of this thesis, one of the key chapters is chapter five, which reviews the project in different phases and hence creating a timeline of the changes and process descriptions of each step of development. In the beginning, chapter five presents the main tools the forwarding team is using in their daily work, hence giving a background for the changes made and presented later in the same chapter. However, chapter five leaves the results of each step of development for the next chapter. In the next chapter, the key improvements to the order-to-delivery process are indeed revealed from the perspective of each function most closely affected with the results of this thesis. Later in the same chapter, the places where savings on time, money and resources are made are revealed, which truly uncovers the scale of what effects this project has had to the operating models and lead time of the whole order-to-delivery process, especially from the perspective of the forwarding team. Furthermore, since digital change is ongoing and new inventions are made every now and then, everything cannot be included to the same thesis. That's why, also the proposals for further research are given out in chapter six based on the work concluded in this thesis. Finally, in the last chapter, the project will be brought together in the form of conclusion based on all the previous chapters.

2 Digital transformation in companies

Digital transformation is the force transforming society and industry. Due to the introduction of digital technologies within the organization or in the environment where the organization operates, digital transformation results in changes and benefits for businesses. (Parviainen, Tihinen, Kääriäinen & Teppola, 2017). Hence, digital transformation can be defined as “use of digital technologies to radically improve the company’s performance” (Vial, 2019). Additionally, operating costs can be reduced up to 90% and turnaround times can be increased by many orders of magnitude. Furthermore, decreasing the use of paper and manual processes with software’s, lets the companies to collect more information to be used for better understanding of process performance, cost drivers and risk factors. (Parviainen, et al. 2017)

It is important to clarify the terminological confusion with digitalization and digitization. Hence, digitalization and digitization should be kept apart even if they are frequently used simultaneously, which applies also to digital transformation. Digitization is the basic concept established by computer scientists since the invention of the first computers. It is the technological process of changing analog inputs into a digital form, and finally into binary digits. It also changes information from a physical into digital form. (Legner, Eyermann, Hess, Matt, Böhm, Drews, Mädche, Urbach & Ahlemann, (2017). One example of digitization process is the establishment of an operational foundation or implementing ERP systems through a systematic procedure with a specific outcome. (Ritter & Pedersen, 2020).

Digitalization on the other hand has been used to refer to various sociotechnical phenomena’s and to the usage and adoption of modern technology processes in more extended individual, organizational, and societal contexts, such as the application of digital technologies. (Legner, et al. 2017; Ritter et al. 2020) The world of business has experienced digitalization in multiple comings. The first coming of technological advancements focused on using computers to replace paper as a physical container, increasing the level of automation in daily tasks. The second coming concentrated to the introduction of

internet, which brought changes to the way companies create value and gave birth to new business types, such as those in e-commerce and intermediaries. Nowadays, the businesses are experiencing the third coming of digitalization. Now it's concentrating on increasing the processing capability, capacity of internal storages and easing internal communication. Therefore, it is enabling the creation of whole new business models while extending and enhancing current products and services. (Legner, et al. 2017)

2.1 Strategic aspect behind digitalization

One of the most common challenges new companies face, is the lack of resources, which may restrain especially smaller companies from developments and actions required to grow the business. Carefully managing resources, trying to increase efficiency, and concentrating on actions which are made, may be the easiest way, but not the sustainable one. Digitalization might help young companies to overcome their difficulties and able the beginning of growth with smaller investments. (Rosin, et al. 2020).

Three main external drivers of digitalization which push companies to introduce digitalization to their operations are digital technology, digital competition, and digital customer behavior. (Verhoef, et al. 2021). These three drivers could all be combined into the term business culture, being seen as what others are doing. (Brewster, 2021). Moreover, one of the major attributes to all three drivers mentioned is E-commerce and its varieties. E-commerce sales have increased radically since the invention of the World Wide Web being 2.3 trillion dollars in 2017. The field of e-commerce is expected to grow annually across every business field. The change will force companies to reconsider their business models and transform their businesses into more compatible versions with the current markets with customers and competition. (Verhoef, et al. 2021).

The increasing adoption of new digital technologies clearly highlight the need for businesses to transfer their operations to the digital world. Additionally, these new digital technologies may have an impact on the firm's cost structure by robots or virtual agents in place of more costly humans when providing services, or through the use of AI and

blockchain to optimize logistical streams and lower supply chain costs. (Verhoef, et al. 2021)

Nowadays customers can access dozens of different media channels, engage in active and effortless communication with companies and other customers. This way they can experience a rapidly growing number of touchpoints during their customer journey, which many are in a digital form. For many companies, digitalization has meant that newcomers have surpassed their traditional way of doing business with digital innovation and are now suffering as a result. Hence, digitalization is forcing companies to pursue technological innovation, such as artificial intelligence. (Denicolai, Zucchella & Magnani, 2021). As an example, online retailers, such as Amazon and Alibaba, have had a strong effect to traditional retailers and their brick-and-mortar store's. Furthermore, these new digital companies are not just limiting their operations to the traditional retail industry but are instead taking leverage from their digital capabilities to enter completely unrelated markets due to growth possibilities. (Verhoef, et al. 2021)

Rise of new digital technologies has changed the competition field dramatically. In retail industry, technology has had an effect to the competitive landscape, moving the revenue stream towards new digital companies. Hence, large information-rich companies from the United States of America such as Amazon, Alphabet, Apple, and Facebook and China such as Alibaba, and JD start to dominate many industries, and consequently the competition has grown both in scope and intensity. Particularly, this change is reflecting to the valuations of these companies. (Verhoef, et al. 2021)

In relation to large companies and their digital platforms, transparency is often discussed alongside with digitalization due to problems which might occur with internet safety as well as the origin of products sold online. Moreover, one of the key components of civil society is the transparency of governmental power (Mynenko & Lyulyov, 2022), which is why it should be noted that the national economy's security policy has changed because of digitalization, alongside new vectors, such as data- and information security. Hence,

the increasing importance of digital technologies which ensure standard components related to national security economic, social and information should be considered more often. In a conclusion, there is a close relationship between transparency and digitalization since, on one side the development of digital technology helps to grow transparency, accountability, and public awareness. Digitalization simultaneously enhances the business model's efficiency and transparency as well as the public administration systems. (Kostetskyi, 2021).

During the past decade, digital technology has had a significant change what comes to the way of doing business. Companies are no longer changing themselves just to please their customers, but also to change their operations to a digital version for developing new operating models which can bring new possibilities introduced through digital transformation, and this way differentiate themselves from the competition. (Agostini, Galati & Gastaldi, 2020).

Digital transformation has an effect to the market competition strategy for manufacturing companies. Hence, the manufacturing process of digital transformation has a significant effect to promoting companies on implementing differentiated competitive strategies, while at the same time preventing their rivals from the implementation of cost-competitive strategy. Companies need to be aware that manufacturing companies with higher viability inside the market are more capable of adjusting to digital transformation and thus are implementing different competitive strategies from their competitors. Hence, businesses with high viability can benefit more from innovation incentives, despite the size, ownership, or the productivity of the business. (Wen et al., 2022).

The amount and capabilities of digital technologies are increasing daily, which leads to the collection of extensive amounts of data from devices and applications linked to those digital technologies. This forces companies to assess and change their operating models to match with the constantly changing environment. (Correani, et al. 2020). This means

that the traditional perspective companies use to view their IT strategy as subordinate to business strategy must change. (Nadkarni & Prügl, 2020).

Digitalization has effects on individual behavior and requirements, by altering existing processes and creating new ones. Furthermore, it has effects on intra- and inter-company collaborations by enabling new sort of automation possibilities for companies. (Kerpedzhiev, König, Röglinger & Rosemann, 2020). Hence, failing to take critical aspects into account in change management in relation to employees and clients who must alter their working habits and the way of interacting with the company is one of the reasons why a digitalization projects might fail. (Correani, et al. 2020).

The start of digitalization should happen after an awareness that how dependent current internal procedures are of stable market environment. Even though this process might have been contributing to the company's previous success, it might also be the prevention of being competitive in the future. Hence, in addition to the current near-term strategy, businesses must begin on a wider digital transformation in order to stay in operation in the long term. (Björkdahl, 2020).

Companies with the most success have used decentralized digital transformation, have flexible process and are learning from the mistakes they make. These companies have established cross-organizational teams who have clear vision where the company is heading with their digital transformation. These teams are motivating the members of the organization by communicating with them about new possibilities and solutions for problems they might have and that way pointing out places where investments and changes are needed. In order for the motivated teams and skilled employees within the company to achieve success in digital transformation, it is crucial that the company has a leader that develop a culture of consistent, comprehensive, and present of values and norms that support the implementation and use of digital technology and data. (Björkdahl, 2020; Nadkarni,2021).

2.2 Challenges in digitalization

Organizations all over the world keep working to enhance their value and operations. Realizing the potential additional revenues and opportunities for value creation that come with the introduction of new digital techniques and devices is seen as a problem. The conversion of physical objects or information into digital information, which enabled not only people but also things to connect through the Internet, posed the first challenge for organizations. The current challenge is digitalization, which entails using new digital technology to transform company operations to produce materially more value. (Antonucci, Fortune & Kirchmer, 2020).

The significance of digitalization and its benefits to businesses are widely acknowledged as also explained in chapter 2.1. However, businesses still struggle to understand its potential effects and advantages it can bring. In real life, there are many challenges to be faced with digitalization such as extracting value from the transformation process itself due to gap between the formulation and implementation of strategies. (Correani, De Massis, Frattini, Petruzzelli, & Natalicchio, 2020) The process of digitalization contains the implementation of digital capabilities to support business model transformations, which have an impact to the whole organization including operational processes, resources, internal-, and external users. This is a significant shift in working practices that is built on close cooperation and interaction. (Parviainen, et al. 2017)

Nowadays, companies must be capable of adapting to the unpredictability of changing markets. Companies must be prepared to the change in organizational roles, responding to changing customer needs and to the constant change in technologies. Furthermore, they need to be aware of and ready to react to the rising competition due to the disappearance of market boundaries and entry barrier removals. (Verhoef et al. 2021). Therefore, companies need to iterate themselves through digitalization to stay competitive. (Martin, 2022). Businesses should be digitally adaptable to continuously change and re-configure existing digital assets and capabilities to respond to these problems. Additionally, this will affect how the organization is structured. (Verhoef et al. 2021)

Using digital technologies in a manufacturing company creates more advantage over their competition. However, changing most of the processes inside a company to a digital version means significant costs for the business itself. Even though the process leads to the simplification and reduction of costs related to some processes, it will simultaneously make other processes more complicated and more expensive. Increase on the amount of new processes, usually means also increase on new risks and additional costs associated with the change. (Chudaeva, Mantulenko, Zhelev & Vanickova, 2019).

2.3 Digital innovation

The definition of *digital innovation* has been created to describe the creation of market offerings, business processes and models which were established after the use of digital technologies. Furthermore, the practices, processes, and principles that are behind the effective organizing of digital innovation are referred to as *digital innovation management*. (Agostini, et al., 2020)

Companies are using and implementing digital technologies for various purposes in their innovation process. Hence, studying the advantages, hazards, and impacts about the use of digital technologies becomes increasingly relevant for the companies, as does investigating how innovation processes alter to accommodate to the use of digital technologies. It is also crucial to understand whether applying these technologies requires businesses to restructure how they operate internally. (Agostini, et al., 2020)

Digital innovation is one part of digital transformation due to its ability to change companies and industries fundamentally. (Nambisan, Lyytinen, Majchrzak & Song, 2017). Nowadays, five of the most valuable companies in the world are counted as part of the digital sector. In top of that, character of innovation has gone through a digital transformation. Therefore, new business models linked to digital technology have become more and more important when compared to traditional product innovations. World is constantly moving towards digital version of itself and affecting all parts of organizational

life and culture. Digital technologies are enabling fast growth for young businesses which attracts more entrepreneurs to start their businesses in the digital world. Digital innovation, though, is not limited to the software industry. Digital innovation, and by extension, digital transformation, can be profitable for businesses across all sectors. (Ciriello, Richter & Schwabe, 2018)

There are three ways how digital innovation could be explained in the world of business. First, it has three different aspects that affect how innovations are seen. When a company enters the digital world and has digitized their operations, the information they have can be stored, passed on, changed, and discovered by any available digital device, wherever the user of that device is located. It can change tasks so that these tasks could be done from anywhere, when in the past they had to be performed in the office. Furthermore, once the information has been digitized, it can be re-programmed to match with data received from external systems and that way used more broadly. (Ciriello et al., 2018). And finally, digital technology is needed in a company, to create more digital technology because digital innovation can be described as the use of digital technologies within the innovation process. (Nambisan, et al.,2017). This means that once the company has started to digitize their data and operations, they are able to go further with their digitization, perhaps towards a full digital operation. (Ciriello et al., 2018)

2.4 Stages of digital transformation

Approximately 70% - 90% of the digital transformation projects will fail due to various reasons. The most usual reason for failing is the over-optimistic thinking of the results after the transformation, including the time which it takes to implement the change and the outcome. Other reasons include poor governance and execution of the change as well as using the wrong methods in the first place. Lastly, it's crucial that the pace of the change from old to new is optimal, not too slow, or too fast. Hence, there are three different stages of digital transformation which leaders of companies going through digital transformation need to be aware. (Bonnet, 2022).

The different stages of digital transformation

- Modernization

The first phase is about setting up the ground for the success of later phases, which makes it the most important. In the modernization phase the company is implementing new technologies, designing new applications for the customers, or automating different tasks related to the wellbeing of employees, and thus becoming digitally more agile and smarter which can lead to fast return of investments. (Bonnet, 2022)

- Enterprise-wide transformation

The second phase is more complex phase which sees changes in the value-chain. Enterprise-wide transformation is focusing to the improvement of processes which already exists, hence creating the possibility of new value creation possibilities with more efficient processes and new customer segments. Changes included in this phase may be about establishing a new digital customer interphase for all digital and physical channels the company has. From the perspective of employees, this phase can be about institutionalizing new working practices, or establishing a new culture of learning and skill development benefiting the employee experience. (Bonnet, 2022)

- New business creation

New business creation -phase concentrates on widening the scope of the company by creating new lines of revenue for example by completely changing the traditional business model. From customer's perspective it could be changing from traditional purchase of products to a business model based on monthly subscriptions. This phase is about truly changing the core of the businesses, due to the focus on existing processes, structures, and main capabilities of the companies. In the light of the changes, a well-managed leadership is crucial during the transition from existing business model to a new one. (Bonnet, 2022; Björkdahl, 2020).

2.4.1 Common issues after digital transformation

The costs associated with digital transformation are often large and can prevent some companies from the digitalization of their operating models. The great investment on new technology is costly and can become unbearable due to the large financial investment and the risk of those technologies being outdated soon after the investment. (Alrawadieh, Alrawadieh & Cetin, 2021). Therefore, to tackle the challenge of costs companies looking to go through a digital transformation process needs to have sufficient financial means, before, during and after the transformation. (Furjan, Tomičić-Pupek & Pihir, 2020).

Other important aspect is to have adequate capabilities to facilitate the digital transformation. However, there are ways to complete a digital transformation even with inadequate capabilities. Support received from digital platform service providers for example implemented during the change can give the tools needed to improve managerial and organizational capabilities to the required level. However, to distribute these new skills inside the firm for the employee's, well-managed leadership is once again required so that the company has the possibility to overcome the lack of capabilities. (Li, Su, Zhang & Mao, 2017; Björkdahl, 2020).

As proven, Covid-19 had a significant effect to digitalization and to the way customer is experiencing the retail industry and mobile commerce by increasing the amount of online shoppers significantly. Furthermore, the online sales are being expected to increase even more in the future which is forcing more companies to adopt to digitalization to match with customer expectations since the number of customers operating completely offline are decreasing daily. However, this customer group still exists as long the group of customers used to face to face sales are there. For millennials, the use of digital commerce is the major and most usual way of shopping, when on the other hand older generations are slower on adopting to the digital world. To please both age groups, it is

important to invest to the well-being of customers by creating customer friendly digital environments. (Akram, Fülöp, Tiron-Tudor, Topor & Căpusneanu, 2021).

2.5 Benefits of digitalization

Digitalization, which has usually been linked to resource savings, increased operational efficiency, and more flexibility, suggests significant advantages for new businesses. However, a high digitalization rate does not automatically mean direct savings on resources, such as office space or amount of personnel needed. Instead, it boosts operational efficiency, which generates indirect savings. Additionally, it results as higher market flexibility. (Rosin, et al., 2020). However, according to Parviainen et al. (2017) costs can be reduced up to 90% and turnaround times can be increased substantially. Furthermore, the rise of productivity, product quality and effectiveness of processes, with improved and flexible decision-making alongside the invention of new business models are among the potential impact's companies can receive from digitalization. (Denicolai, et al., 2021) Additionally, replacing paper and manual procedures with software allows businesses to gather additional data to be used in improving their understanding of process performance, cost drivers, and risk factors.

According to Mark Broadbent (2018) digitalization improves the efficiency of a company and its operations, decreases the costs needed and increases sales margins. However, these benefits will only last until the competition and market catches up with the company which went through the change first. Furthermore, early introduction of digitalization has it's downsides, but benefits as well. There is a high risk that there will be problems, but on the other hand high rewards if succeeded in digitalization. Digital technologies can also be utilized to enhance knowledge management procedures, having potential behavioral and structural consequences. Regarding the structural consequences, digital technologies can make it easier to access both internal and external knowledge and promote knowledge transfer among a specific organization's members. (Agostini, et al. 2020)

The value what digitalization brings is not just about the combination of better digital technologies into the existing infrastructure. Rather it shows how the new technology received from digitalization processes can be utilized to transform internal process and create more value to the company. (Antonucci, et al., 2020). Organizations that can go through the digitalization process, are able to replace manual steps in their internal processes which helps them to streamline activities and that way increase their efficiency. Furthermore, digitalization enables companies to follow their processes, and that way also increase the transparency in their processes. This leads to faster decision-making and discovery of those processes which can be improved. (Rosin, et al., 2020).

In the manufacturing industry, the digitalization of the manufacturing process, sales, distribution, and suppliers will have a significant effect on planning and in the quality of management, as well as with optimization of the processes by enabling more precise decisions to be made much faster. Furthermore, because of digitalization, the companies will significantly change their way of connecting with customers, changing, and improving the way in which the management operates. This will lead to a higher quality and the lead time of processes will decrease. Hence, after these actions, new processes will be established, which can be understood on a new higher level due to the elimination of technological obstacles. (Vartolomei & Avasilcai, 2019).

2.5.1 Technological impact

Technological impacts during the process of digital transformation may vary. According to Hanelt et. al (2020) the impact can be either direct or indirect. Direct consequences are updating the software's and programs companies are using. Indirect consequences might be changes on regulations and in demands from the customers. However, today the technological capability and the power of digital transformation is higher than it has been with the previous technology-driven transformations. This can be seen as existing applications designed for digital transformation, such as the Internet of Things, cloud computing, big data and mobile technologies which have far better power of computing,

amount of data storage and ways to distribute information than before. (Nadkarni, et al., 2020).

In the end, the current study on technology integration suggests the importance of flexible IT department, innovative platforms for business and a strong and expandable backbone for operations to be part of the digital infrastructure. Models of technology integration once effective cannot be used any longer in companies which therefore need to be replaced. Furthermore, it is important that the integration of technology and transformation of company activities are integrated to the organizational architectures of companies. (Nadkarni et al., 2020).

2.5.2 Sustainability

Dematerialization of tangible products and objects, such as CDs, books and machinery caused by digital transformation will become timely during the process since digital substitutes will bring far more superior performance when compared to those tangible versions. Therefore, it is important for companies to recognize the process of dematerialization since the effects will become visible as customer benefits and as advantage over competitors. (Nadkarni et al., 2020).

Internationalization of the world and the technological progress countries and companies are making are frequently viewed as potentially harmful to the environment because of problems with pollution or the overuse of the planet's resources. (Denicolai, et al. 2021). Therefore, digital revolution is pushing companies to adhere to environmental sustainability goals, which might become useful in the future since its estimated that the value established from AI in waste management and increasing the usability of products forward could be 127 billion dollars in 2030. (Frey, 2021). These goals are visible for companies as being called to implement sustainable practices and internal and external processes to reduce the environmental effect and preserving the natural resources for future generations. Environmental sustainability means the search of human welfare, while at the same time ensuring that the amount of waste created by company activities

does not exceed the required amount of resources needed, in order to meet the requirements placed by environmental sustainability. (Denicolai, et al. 2021)

2.5.3 Acquirements of a company to implement digitalization

As discussed earlier, the fast development and adoption of digital technologies in companies, as well as the shift in societal norms and organizational practices, are those that promote digitalization. Digital technologies can support advanced process automation, adaptive process execution as well as process data analytics. For a company to take advantage of the potential presented by digitalization, they need to integrate digital technologies into new or already existing processes. (Baier, Lockl, Röglinger & Weidlich, 2022). Furthermore, companies should invest significant resources into developing new capabilities to support organizational digitalization goals, and to fully realize the value creation potential which they already have in their customer relationships. (Lenka, Parida & Wincent, 2017). However, earlier research only shows partial explanations of digital capabilities which also differs from one other. For example, manufacturing companies are competing to have the most advanced technology within their products by adding more intelligence and remote features (Iansiti & Lakhani, 2014), while some companies are investing more into gathering data and analyzing it to achieve higher benefits through value maximization in customer interactions. (Opresnik & Taisch, 2015).

There are several capabilities, which helps companies to enable their digitalization process. One of these is intelligence capability, which consists of the upgrading of hardware components to enhance intelligent functionalities with embedded sensors, microprocessors, embedded operating systems and software programs for example. Furthermore, intelligence capability may provide new possibilities of data gathering related to the condition of products and how the customers use those products. Second capability is the connect capability, which is the ability to connect digitalized products through wireless communication networks. The third capability is related to the increased amount of data gathered from customers, products, and networks for which companies need to have a

strong analytic capability. Hence, supporting the digitalization strategy. (Lenka, Parida & Wincent, 2017).

2.6 Theoretical framework

This chapter will present the theoretical framework of this thesis, on which the research and conclusions are also based on. The frame has been created by using previous research about the subject and a theoretical review.

The framework consists of topics, which are closely related to the research which will back up the process and conclusions in the end. These topics are for example digital transformation, and the various issues and things related from challenges to benefits. In addition, digitalization is a key part of the frame of reference, since the whole process of this thesis is based on digitalization of the forwarding function and its daily operating methods. It is also important that the theoretical frame of reference is providing definitions to the keywords presented in the theory which are important for the research itself. (Scribbr, 2018). The main objective of this research is to observe and identify the key issues of the forwarding function in the commissioning company and start the digitalization process inside the forwarding function. The theoretical part of this thesis will support the digitalization with definitions and earlier research to prove that the conclusions and improvements are efficient. The theoretical framework is illustrated in figure 1, where the process itself is driven by the goals of the digitalization process and backed up by communication, observation, discussions, and meetings held throughout the process.

The frame of reference also presents the importance of well-managed leadership in a company going through a digital transformation. In addition, it is also essential that the discussion is on-going throughout the company not only during changes, but constantly. This will boost the efficiency and performance when employees are satisfied and know where the company wants to be. (Tkalac Verčič, Sinčić Ćorić & Pološki Vokić, 2021). The theory of this thesis presented the strategic aspects behind companies' desires to go

through a digitalization process. Despite the challenges and difficulties, it might bring, the benefits related to competition and customer satisfaction are clearly significant enough for companies to start the process of digitalization. Furthermore, the increasing amount of laws and requirements for companies mentioned in chapter 2.6.2 are driving companies towards the benefits of digitalization. In addition, the future of businesses in all industries is becoming more digital, and it will be a mistake if companies in any industry are not considering moving towards a digital platform for their sales and customers.



Figure 1 Theoretical framework

All the issues presented in the theory show how much there is what to think about when companies are planning and implementing a digital transformation or digitalization

inside their functions. Even though the strategic aspect behind the reasoning for digitalization might be similar for companies, the challenges may vary due to differences in the companies themselves. Same applies to benefits and to the pure scale of them. The situation is the same with the commissioning company and this thesis. The problems, challenges and development targets of this thesis are unique to the commissioning company and its forwarding function due to differences in working methods, employees, and standards for example. This also proves why digitalization methods and results from action research cannot be applied directly as they are due to differences on how things used to be before digitalization. However, the conclusions indicate what can be achieved with digitalization in a company of this size.

3 Methodology

This section will go through the methodology of this thesis. Also, the requirements for action research are discussed and introduced. Furthermore, the data collections methods and analysis are presented. In the end, this section will also present the reliability and validity of this project.

3.1 Research method

The aim of this study is to go through digitalization process in an international company and see how the process of introducing improvements to the order-to-delivery process is affecting the lead time of the whole process, and hence studying what are the side effects caused from the main changes. Since the digitalization can be seen as a process, which consists of multiple layers and steps, the research has been created as action research, where the writer of the thesis is working as a project manager. Action research itself is technically not a research method, but it can be used as an approach to connect practical development and research and is usually related to the qualitative research method. Typically, research is being guided from a theoretical background. However, in action research, the goal is to find out how things can be improved and done better in the future by improving working methods. Thus, researcher is actively participating to the process and making decisions pointing to a certain direction. Despite being practical, there still is a requirement for action research to systematically use scientific methods. (Raine & Aarnos, 2018; Puusa, Juuti & Aaltio, 2020).

There has not been success in finding a clear definition of action research as a research methodology. This is because action research is used in number of disciplines, and there are several schools of literature which differs from each other from the perspective of methods, goals, and background assumptions. Furthermore, the schools of action research have been classified according to the points of interests, such as various social movements and working life research. However, all the schools have something in common. Schools are being united due their attachment to each other, perception, reflecting

and altering of activity. Also, the thought of researchers and actors participating simultaneously during the whole research process is common between these different schools. (Puusa, et al. 2020)

Action research is using feedback and learning, as a baseline to the research. Hence, it's suitable to be used in developing organizations. Learning can be used for example in operation models, attitudes, and the way of leading the organization. Furthermore, learning is about learning new things together inside the organization, with people from different functions, such as management and employees. (Puusa, et al. 2020). From this perspective action research is used to find information which would serve in proving operating models. (Raine et al. 2018).

In action research, starting with figuring out what is the research question is not so essential than it would be in a qualitative approach, where the research is started from a theoretical interest and not from possible practical benefits. Instead, the action research process starts from defining what is the task and goal of the research. This is because action research is used to find information, which could be applied and utilized to improve existing operating models. Therefore, the key element in action research is more about finding out how things should be in the future, and not to figure out how they currently are. (Raine et al. 2018). However, to put things in perspective, there is typical way an action research project might start, even though each action research projects are different when compared to each other. Example of some of the most common steps in an action research process are described in figure 2. (Altrichter, Posch & Somekh, 1993).

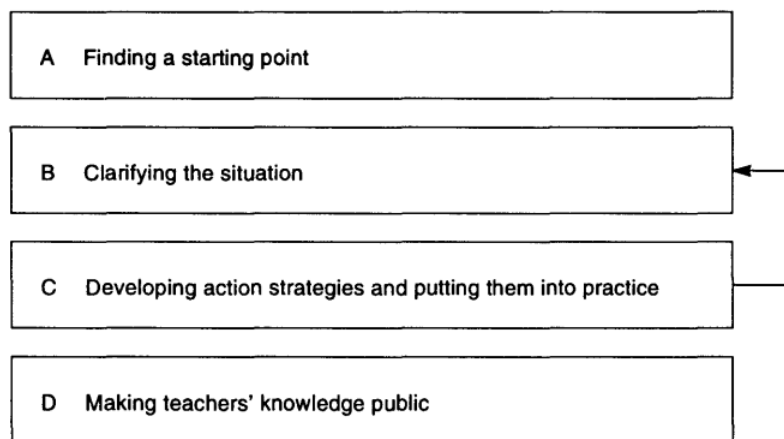


Figure 2 Steps of action research (Altrichter, et al. 1993)

As described in figure 2, the action research process starts from discovering the starting point and having the clear motivation of seeing the process of action research through. In the second phase, the situation where the research, and the researcher are will be clarified through data acquired through conversations, observations, and interviews. As a result of this clarification, action plans are created and implemented in step C. Before entering the final step (D), the researcher might need to go through the process again, since effects of previous plans and actions might lead to new experiences, which could lead to the need of having further action plans and strategies. Therefore, before entering the next phase, each cycle is examined and studied by utilizing a variety of data gathered from each intervention. (Eden & Ackermann, 2018). This is a circular motion called re-search cycles. Once the researcher is convinced that the process has stopped, or slowed down enough, the findings will be presented to others, such as companies or other researchers. (Altrichter, et al. 1993).

The action research process of this thesis is following a similar pattern as described above. As mentioned by Altricher et al. (1993), the process started from the discovery of the starting point. However, in this research, the discovery was not so simple, since the idea of the digitalization related to the decreased use of paper had been present within the commissioning company for few years prior to the start of this thesis but had not been acted upon due to more urgent issues related to the pandemic for example. The

actual starting point was discovered after discussions with the forwarding team, and the manager of packing and shipping team. Through the observations of all individuals concerned, the action research process could therefore be initiated. Situation was therefore clarified during the spring of 2022 with number of meetings, where this research and the process and its goals were thought and discussed. In these meetings it was decided what should be the preliminary goal of the project. Hence, after the determination of the goals of the project, the actual process was started with various developments put in place simultaneously, which will be discussed in the project review in more detail. Finally, in the final phase, the findings and improvements made during the process are made public to the whole commissioning company, especially those affected by the changes.

One of the key aspects of action research is reflective thinking. Traditionally reflecting means that human is reviewing their own beliefs, way of thinking and experiences, and thus trying to understand why they are doing things how they are from a new perspective. With the help of reflection, humans are trying to achieve new way of understanding action and thus improving existing operating models. For example, in a company where working habits have become routine, are to be questioned to find answers to what goals these routines are seeking. In action research, reflecting shows when action research is thought as a self-reflecting ring, where action, diagnosing, reflecting, and re-planning are following each other. Reflective ring creates a spiral moving through time when reflective rings are placed after one other. The spiral is describing how thinking and action are related to each other as consecutive planning, action, diagnosing, reflection, and re-planning cycles (Figure 3). (Raine et al. 2018).

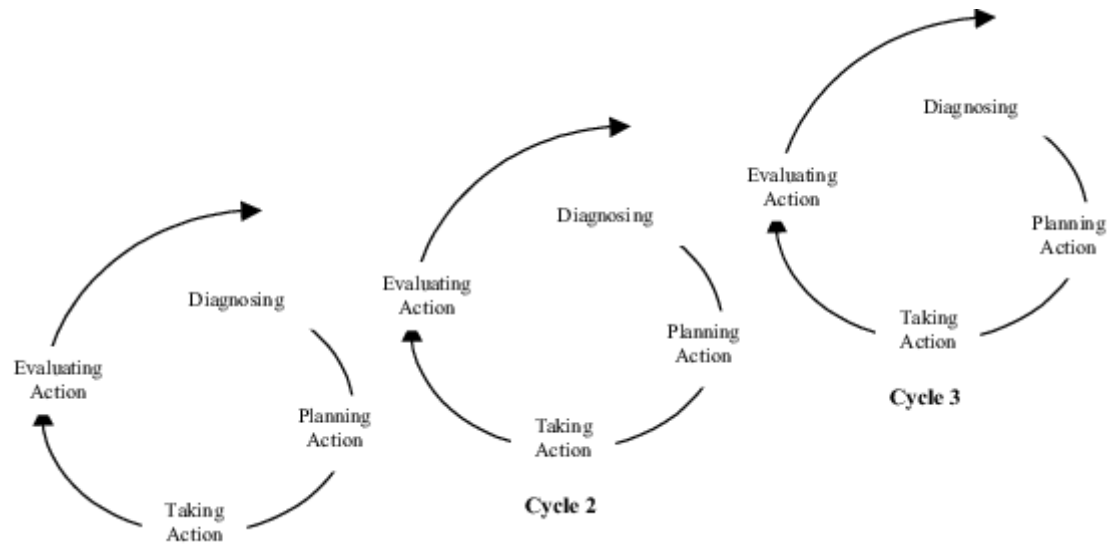


Figure 3 Spiral of action research cycles (Nunes & McPherson, 2002)

Reflective thinking shows in various ways in the action research of this thesis. The researcher is reviewing their own way of working with and inside the forwarding team, in the order-to-delivery process and trying to find alternative ways to do their work. One of those methods is trying to understand how a new employee would see the current working methods, and thus trying to increase the usability of programs and methods to a simpler level. Furthermore, since the actions and decisions made from the findings of this thesis effect not only the forwarding team, it is also important to consult the employees working in various positions inside the order-to-delivery process, to find new places of improvement, and perhaps find completely new perspectives to the digitalization process which the researcher have not previously thought about.

Intervention has a significant meaning in action research, since the researcher is part of the community being researched and reads the situation from the inside, when in traditional research the researcher is studying the object from a distance. (Raine et al. 2018; Puusa et al. 2020). Furthermore, the role of the researcher is significantly different than in traditional research since the data is gathered from those practices and theories what the object inside the company have adopted. (Puusa et al. 2020). However, there has been debate related to action research because the goal of action research in many cases

is to change the reality, which is not the case in normal academic research. One of the controversial issues has been the objectivity of action research, the multidimensional and in many cases contradictory role of the researcher in various research situations and the relationship action research has with conventional development projects. (Jyrkämä, 1999).

The key data for this research is collected through observations from employees during the process of digitalization, especially when new changes are introduced to observe if the change is going to the right direction. Observation in action research means following how things happen, and how things are done by following the actual employees doing it. Observation methods can be for example recording, describing, analyzing and the interpretation of employee behavior. In this thesis, the observation is conducted as participant observation, where the researcher is participating fully to the actions of those the researcher is following, and this way becoming a member of this group, organization, or community. This allows the researcher to share their own experiences just not through what is happening, but also through their own feelings. (Sanders, Lewis & Thornhill, 2007). There are four ways how the researcher can participate to the observation. These are complete participant, complete observer, observer as participant, and participant as observer. (Gill & Johnson, 2002).

The researcher of this thesis acted as a participant observer, which means that all parties knew the role of the researcher within the project. This role allowed the researcher to ask questions from the subjects of the project to increase researchers understanding of various matters related to the project, which would give more insight to the researcher how the different parties of the project thought. (Sanders, et al. 2007). The action research process of this thesis is illustrated in figure 4.

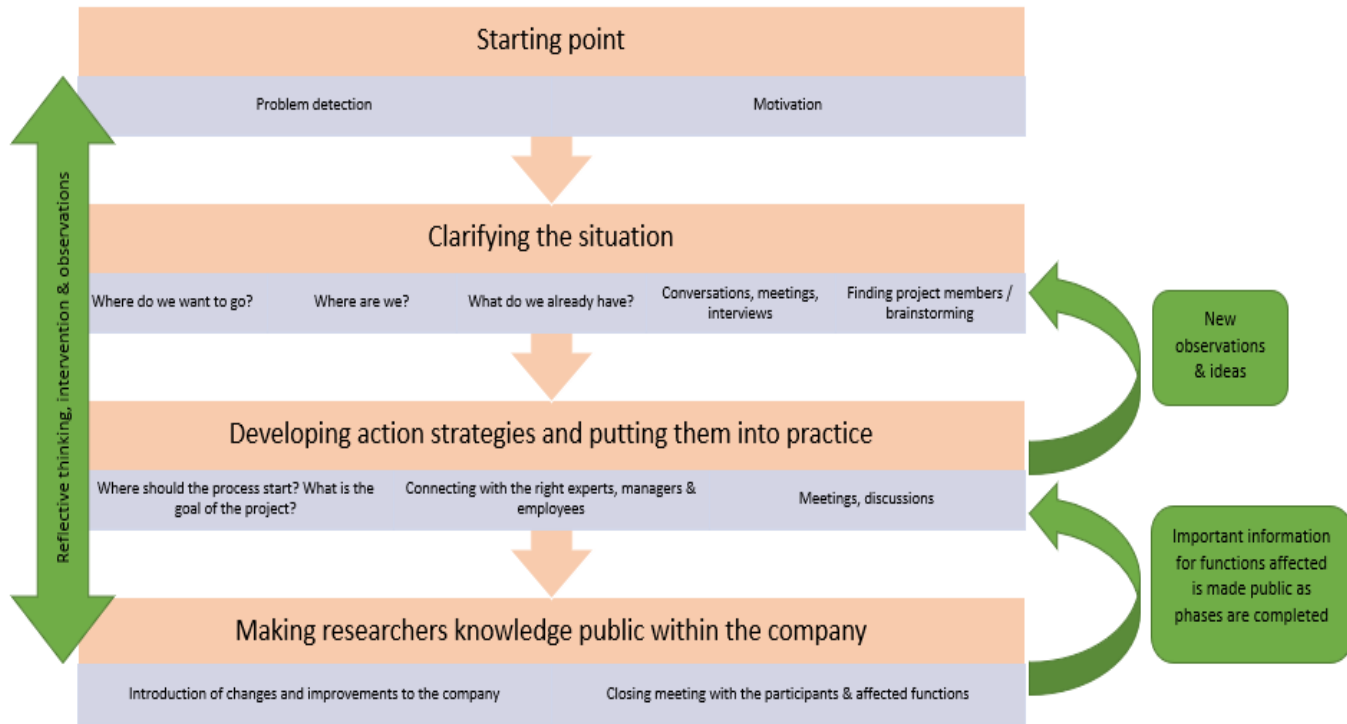


Figure 4 Thesis action research process

Since the thesis has been structured as action research, the importance of interviews is not so significant when compared to case study. However, interviews had a significant meaning to the goal of the project to follow what reactions the changes to the processes were causing, and how the new improvements were taken into use. In action research type of research, data collection methods do not differ from the data collection methods in qualitative research for example. They can be used in action research with collection methods from quantitative research. Action research differs from qualitative research in one major way. There are three steps in qualitative research, which are planning, data collection and analysis, when in action research, there is one extra step in addition to the three already mentioned. This step is called action. Furthermore, each step could be explored and studied more than once to find more data and areas for development, before entering the next stage. (Eden et al., 2018). When the research is considered to be finished in qualitative research after the analysis, the action itself springs from the analysis in action research, as illustrated in figure 4. Hence, the results can really be monitored in action

research when in qualitative research the research is just giving out suggestions. (Kananen, 2014).

In this research, standard interviews were not conducted. The analysis is based on data gathered from meeting notes written by the researcher throughout the whole process, from the starting point when the goals of the project were determined, to the point when this research was concluded. However, to determine how the changes would affect other divisions of the commissioning company informal interviews of the changes were conducted to back up the digitalization process of invoice archiving. The findings from these interviews conducted, will be introduced with the key improvements in chapter 6.

3.2 Assessment of research's quality

In scientific research, the proof of the reliability of the results is required, which means that the results of the research are correct and can be trusted. The foundation of trustworthy information starts from the proper preparation of research layout, which means that the research is studying those objects related to the research problem and that the research methods and measures are properly used. The quality of a research should be proven in every research, hence being the key criteria for scientific research. The quality is evaluated through two concepts, which are reliability and validity. (Kananen, 2014). In research, the validity of an research means that correct things are being researched, when reliability means that if the research would be repeated, the results would stay as they were in the first research. (Silverman, 203-207,1997).

The problems in the assessment of research's quality is that the same measures cannot be applied into all research method types since the starting points and goals in various research methods are different. For example, in quantitative research, the quality can be proven through reliability and validity, when instead in the qualitative research some of the forms of validity cannot be applied when assessing the research quality since researcher-specific interpretations cannot be made from the data gathered in the research. The most problematic research quality assessment is usually with action research, since

assessment methods of qualitative research cannot be applied into action research, even though action research is considered to be part of the school of qualitative research. (Kananen, 2014). In action research, the key element in the assessment of research quality comes from the accurate documentation of research data, data collection methods, as well as other methods used to get to the conclusion of the research since without those it is otherwise impossible for an external evaluator to conclude anything about the reliability of the study. Furthermore, the portability and generalizability are also based on documentation when reviewed from the perspective of starting point and description. (Kananen, 2014)

In this action research, the results and the quality of the research is proven through calculations of savings in money, time and resources gained through the actions and changes made to the order-to-delivery process, especially from the perspective of forwarding and shipping processes. Areas of savings are presented in chapter 6 with the key improvements.

4 Digitalization of forwarding in the order-to-delivery process

This chapter will present the background of the study and reveal the commissioning company as well. Furthermore, the commissioning company, its business segment and main products are also introduced. Also, this chapter will also present the current state of the order-to-delivery process in the commissioning company, especially from the perspective of the forwarding function. In the end, the digital strategy of the commissioning company is presented giving an insight to the motivational background of this study from the company's perspective.

4.1 Background for the study

This master thesis has been written as an assignment for the commissioning company to study and improve the forwarding process and departments next to it inside the order-to-delivery process in ABB Oy's Distribution Solutions function. The idea was to improve the weakness found in the forwarding process and raise the function inside the company to a new level through digitalization. Simultaneously other functions, such as packing and shipping functions were enhanced to perform on a same improved level as the forwarding function.

The researcher of this master thesis is working in the forwarding function and had noticed that there was room for improvement. The main reason however, for the digitalization was the old-fashioned way of working in the function in question, and the new environment created by Covid-19. In the beginning of the project for the improvement of the forwarding function, all products leaving the factory still needed printing paper to leave the premises. Therefore, the main goal is to take the forwarding function of the commissioning company through digitalization into paperless forwarding.

4.2 Company introduction

The commissioning company of this master thesis is ABB Oy, and its Distribution Solutions function. In Finland, the Distribution Solutions function is responsible for the development, manufacturing, selling, and marketing of protection relays and control-, automation- and monitoring devices used for electricity distribution networks. Main locations for Distribution Solutions in Finland are Vaasa and Tampere. Distribution Solutions factory in Vaasa has a high competence in remote control- and monitoring devices, which are extensively used in energy and industrial companies throughout Finland. (ABB Oy, 2022)

Distribution Solutions has been divided into several different parts, in which all have their specific field of expertise. First one is Distribution Substation Products which consists of Relay factory with global market allocation, global manufacturing support for all the factories and main research & development hub for Distribution Automation. The second one is Digital Systems, which include Grid Automation Solutions and the Intelligent overhead line switches and reclosers in the European markets. The third one is Electrification Service, which is responsible for the lifecycle services for all products with Finnish origin, as well as field service in Finland for all LV and MV products and systems. (ABB Oy, 2022)

The Distribution Solutions function has sales into more than 90 countries in all regions across the world. In 2020, the revenue was 200 million USD. However, with 1,5 million different products in the product catalogue, the estimated market size is 1,5 billion USD. (ABB Oy, 2022)

Protection relays are used as a failsafe in electricity distribution networks, to identify a malfunction and communicate about it to raise the safety and reliability of electricity supply. With the use of protection relays, electricity manufacturing based on renewable energy is complementing centralized production. As a result, network monitoring, control and protection have even higher roles to play to protect the electricity supplies and

guarantee a shorter breaktime in case of power outage. Relays manufactured by Distribution Solutions can be used for example in Oil and gas segment of oil platforms or in a Safe Host data center to provide protection for power availability and network access. (ABB Oy, 2022)



Figure 5 Example of relays manufactured by Distribution Solutions (Relion 615 series)

The researcher of this master thesis is working for ABB Distribution Solutions in Vaasa in the forwarding function in a team of six with the responsibility of shipping manufactured and purchased products and parts to the customers. Researcher is closely operating with order handling, packing, and shipping department, as well as purchasing department. Job description contains creating shipments via various transporting companies and assuring that the shipments will reach their destinations.

4.3 Order-to-delivery process in the commissioning company

The forwarding function in the commissioning company is operating closely with packing and shipping functions. In addition, the shipping companies are included to the process as the final function operating inside the company walls. As the world has modernized, information technology (IT) has expanded in many industries and has grown to be a

significant factor. IT is an important factor for companies in their process of developing their operations, particularly in the area of goods transportation services, which can be strongly tied to IT. However, several businesses continue to run their operations manually which results in significant operational costs for the company. (Synthia, Fahira, Hima-wan & Keke, 2020). Only in the forwarding function of the order-to-delivery process in the commissioning company, there are number of issues creating unnecessary costs, which could be eliminated by going through a digital change. These costs are for example the overuse of printing paper within the process and the disposal process of information security dumpsters, which are used for the destruction of confidential papers.

The current forwarding process inside the order-to-delivery process starts, when the documents of packed orders are delivered to the forwarding team from the packing department, which is described in figure 6 as dotted line from "*Pakkaamo*" to "*Huolinta*". These documents are picking list and packing details, which contain information related to the order, such as delivery addresses, customers numbers, mode of transport, product descriptions, dimensions, and weights of the packed products and so on. In forwarding, those documents are then divided geographically, and according to mode of transport into their own shelves. From this shelf, the employees of the forwarding team can pick up orders which are ready to be shipped and create necessary shipping documents and book shipments from shipping companies.

Once the order has arrived at the desk of a forwarding employee, they will check what is the most suitable mode of transport to that particular order according to the dimensions of the package, as well as to the customers wishes. Once the mode of transport has been determined, forwarding will add mode of transport to the order, and depending on the destination of the shipment, possibly add also tariff preference clauses in the SAP production control system, which are then printed to the shipping documentation of each order. These shipping documents in most cases consists of shipping invoice and packing list.

The goal of invoicing is to create an invoice which the recipient of the shipment can use to make the payment. However, a similar invoice is also used for customs purposes. A significant part of the invoice creating has been automated to ensure that the possibility for human mistakes is as small as possible, which has been a problem across the industry (Fleet Owner Staff, 2018). Once the invoice has been created, forwarding will order a shipping company to pick up each shipment, and will then create waybills and shipping stickers for each shipment which the shipping company can use to identify those shipments. Finally, once all documents have been created, the documents will be picked up by the packing function from forwarding and then delivered back to the shipping area. This is described with the dotted line from “*Huolinta*” to “*Lähetämö*” in figure 6. In the shipping area, shipping documents are attached to the packages, and are prepared for the pick-ups by shipping companies. Finally, in the end of the day, the shipping company will pick up the goods from the shipping area, as described with the solid line from “*Lähetämö*” to “*Huolintayhtiö*” in figure 6.

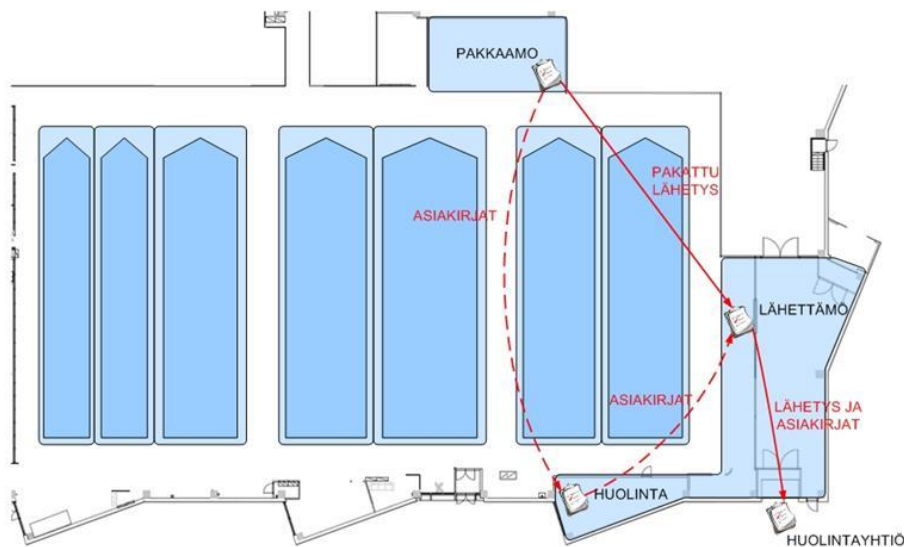


Figure 6 Forwarding process

4.4 ABB Oy Digital strategy

Digitalization and automation have enabled the industry to start the process through a significant revolution. ABB Oy's goal is to deliver the true value received from digitalization, while at the same time move towards smarter, safer, and constantly more autonomous operations, and this way rise the ladder of customer value chain, as a trusted partner. (Ramachandran, 2020). As mentioned earlier, companies are struggling to gain value from their digital transformation, due to a problem's connecting the strategy formulation, and strategy implementation. (Correani, et al. 2020). This means that the company might have a strategy in place, but they don't know how they should start the process of putting the strategy in motion. These problems cause difficulties for the companies experiencing them, since in the increasingly competitive business environment, most companies are heading towards operational excellence in areas of quality, performance and reliability using the minimum amount of money and resources, while doing all these with safe and sustainable manner. (Ramachandran, 2020).

In digitalization, data is the key element seen as a problem, but also as a solution. (Ramachandran, 2020). Continuous flow of data is one of the crucial components when it comes to the development of real-time transport monitoring and management. For instance, traffic data received from transport services owned by governments is in theory already opened but is not always accessible. Thus, new digital solutions, applications, and modern architecture's that are dependable and interoperable are desperately needed. (Inkinen, Helminen & Saarikoski, 2019).

Hence, more data is received from modern transport services, companies, and plants than companies and governments can use. Therefore, those entities who can use that data, and transform it into insights at the right time, will receive decreased costs related and create possible competitive advantage through performance gains in comparison with their competitors. At ABB, the solution to utilize the data received, is through a platform-driven approach, in which they need to integrate and contextualize the data they receive from number of systems such as information, operations, and engineering

technology. Moreover, to get all the benefits from the data, ABB needs to retrieve the data across the whole organization. For ABB to produce meaningful, and insights which lead to action, they need to automate the integration and data contextualization, prior to the use of artificial intelligence (AI) and analytics. (Ramachandran, 2020).



Figure 7 ABB strengths in enabling powerful industrial outcomes

ABB Oy has the ability to provide digital solutions for some of the most complex problems the technology industry has. These capabilities include ABB Oy's strength in the data-domain technology and their ability to handle the whole range of digital systems, from integrated digital systems to smart digital equipment and assets. Therefore, ABB has introduced the ABB Ability™ platform, which powers hundreds of digital solutions created by the company. Furthermore, ABB Oy also has recently introduced ABB Ability™ Genix Industrial Analytics and AI Suite, which combines the company's industrial automation and deep domain expertise with Internet of Things technology and advanced analytics investments to support customers in realizing a safer, more efficient, and financially rewarding future. This process is described in figure 7. (Ramachandran, 2020).

ABB Oy has number of digital transformation and digitalization projects, which have been efficient and profitable. One of those is their ABB Ability™ Collaborative Operations program, which has had a major impact from customers perspective. ABB Ability™ Collaborative Operations is a service delivery model, which is created to connect people in factories, headquarters, and ABB to provide them unbiased data insights, which can be used to enhance plant efficiency to increase customer profitability, increasing the level of safety, while lowering the risk and costs involved as described in figure 8. (Ramachandran, 2020). This connection will have a significant meaning in the future, since operational planning, control, and all levels of company's operations must co-exist in the same environment, complementing one another, without the use of redundant or competitive services. (Isaksson, Harjunkoski & Sand, 2018).

With ABB Ability™ Collaborative Operations tool ABB Oy can help their customers with transforming and improving their customer support, with a full-time access to ABB Oy's own experts. With the use of this tool, ABB Oy is now connected themselves with more than 900 industrial facilities, approximately 1200 marine vessels, and more than 40 mines, hence helping them to achieve higher productivity, increased uptime, safety,

enhanced operational performance, reduced maintenance costs, as well as smaller energy and fuel costs. (Ramachandran, 2020).

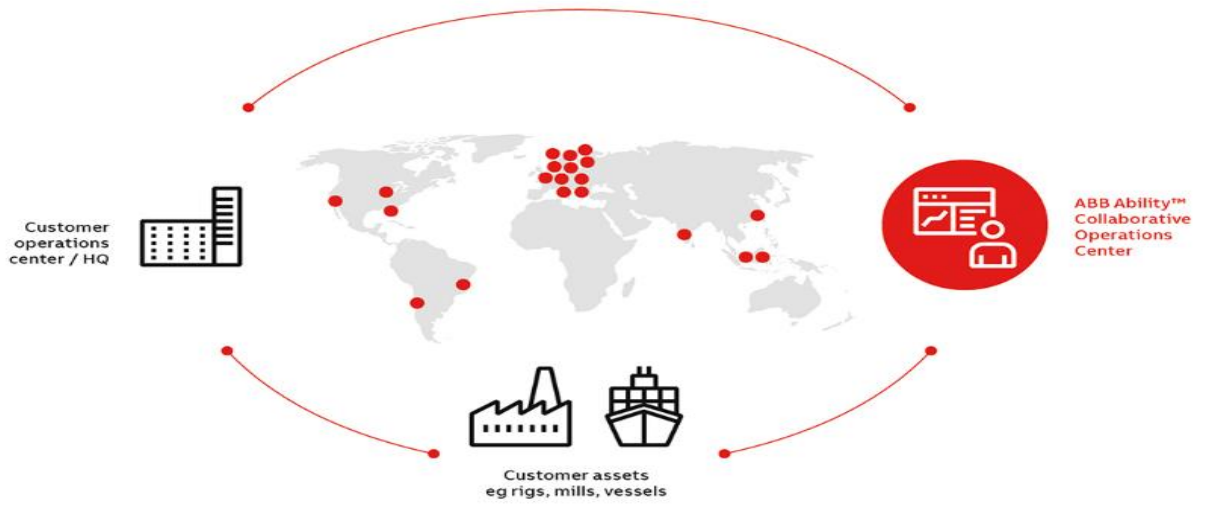


Figure 8 ABB Ability™ Collaborative Operations

5 Digitalization of the forwarding process

This chapter will review different phases of the project in detail, revealing the different parties involved. Furthermore, in the beginning of the chapter different tools used in the forwarding team and the responsibilities of the packing function is presented to give insights to the project inside the commissioning company.

5.1 Introduction of current working methods

This chapter will introduce the other departments working simultaneously with the forwarding department as well as those systems the forwarding team is using to book those shipments to the company's customers. These introductions will give a closer look to the daily working life inside the forwarding function, hence revealing slightly the background behind the research.

5.1.1 SAP

Systems Applications and Products, or commonly known as SAP is an enterprise resource planning (ERP) software which is a centralized system which has been created for companies and enterprises to allow access to shared data inside the company. SAP makes it easy for companies to operate globally in software environment which is known all over the world. SAP software consists of hundreds of different transactions created to match with the wide needs and requirements from companies. The software allows its users for example to view and create purchase orders, projects, invoices, and other data needed throughout the order-to-delivery process of a company from purchasing to shipping. Founded in 1972, SAP is nowadays one of the main management software's used in the world of business. (SAP, 2022)

In the forwarding team of the commissioning company, SAP is used for various tasks. These tasks are for example creating deliveries, invoices, and shipments. SAP is the main tool for booking shipments for the forwarding team, along with nShift, which will be introduced in the next chapter. There are three different shipping queues, which

forwarding team is using to create shipments in SAP, along with dozens of support transactions. First queue is called ZSHIP, which is the main tool used in the forwarding team. Through this SAP transaction, forwarding team can view the amount of completed, and upcoming deliveries. Furthermore, this transaction has “shortcut” buttons, which allows the handler to view orders, invoices, addresses and other information related to the shipment which could be useful when the shipment is booked. Through this queue, the handler will enter all the shipping information required for each shipment. This queue is also one of the main areas of development, since this queue goes through major changes during the project of this thesis, which will be reviewed more closely in chapters 5.4.2 and 6.1.1. The other two shipping queues the forwarding team uses are designed to work hand-to-hand with the nShift program. Once the handler has finished creating the shipping documents, such as invoices and packing lists and filled all the information required on the ZSHIP queue, the handler of the order will create the shipments using a specific queue, designed for different purposes, one for courier shipments, and one for shipments using airfreight. Through the information added in the main shipping queue, the shipment will be visible in the second SAP transaction ready to be booked. Inside the secondary shipping queues, the handler will check the information, and will then save the shipment, which causes a message to be sent from the SAP system to the nShift system.

5.1.2 nShift -delivery management software

nShift is a delivery management software, which the forwarding team is using as a tool to book shipments alongside SAP software. nShift provides accurate management between various locations to keep expenses under control and help to keep customers satisfied. In addition, the system helps to keep clear visibility of the shipments and reduce operational costs. (nShift, 2023). nShift is operated in a cooperation with SAP. As explained in the previous chapter, the forwarding team is using a specific SAP transaction to book shipments. Once the shipment is booked in the SAP interface, the shipment and the information related to it, such as addresses, item descriptions and weights are transferred automatically to the nShift system, from which the shipping documents, such as

waybills and pallet stickers are printed from and then attached to the packages. Furthermore, nShift will also send information to the transport agency responsible of each shipment that there is package waiting for them to pick up. The system also allows to make changes to shipments and follow them during their transport to the receiver.

5.1.3 Packing department

Packing department is responsible of packing the products once they have been completed from the production phase. The packing process starts from the packing queue, which is integrated to the SAP production control system, which was introduced in chapter 5.1.1. This queue will automatically order those orders which has been completed from production according to their delivery dates. Furthermore, it only shows those orders which are completely ready from production or have the permission from customer to do a partial delivery. In the next phase, the employee responsible of packing will collect the products from the end of production line and take them to the packing department to be packed where a suitable pallet or carton is picked, and product placed inside. Once the packing has been sealed, dimensions and weights are entered to SAP and the process in SAP interphase is marked as ready from the packing phase. Once this has been completed, ID-number is printed out for each package which helps the identification of packages while they are going through the logistics process. In the final phase, picking list and packing list are printed out from SAP, and delivered to the forwarding team for the next phase which was introduced in chapter 4.3.

5.2 Starting point of digitalization

In the beginning of the digitalization project of the forwarding function in ABB Oy's Distribution Solutions unit, paper was still the primary tool to be used with shipments and communication between the forwarding and shipping team. Documents, such as invoices, packing lists, picking lists, packing details etc. were still printed on paper.

As described in chapter four, employees in the shipping and packing department were required to deliver picking list's and packing details by hand to the forwarding team,

where the employees could see what they had to ship to the customers. This process is time consuming, since even the physical distance between the office space where employees of forwarding are currently placed is approximately 100m where the packages prepared to be shipped are located. Hence, this has a significant effect to the lead time of the order-to-delivery process. Furthermore, the use of paper meant that the forwarding team was required to work close to the shipping team, which was especially difficult during the times of quarantine related to Covid-19. This raised questions among the managers of the commissioning company, that would it be possible for forwarding team to accomplish their duties with minimum physical presence at the office. The commissioning company had acknowledged the problem with the overuse of paper, and the need of physical presence, and decided that change was needed. Furthermore, as introduced in chapter 4.4, the digital strategy at ABB Oy is thriving towards more digitalized working methods. Hence, it's important that the various functions at the commissioning company, such as the forwarding function tries to achieve an increased level of digitalization in their operating methods to match with the company's digital strategy.

5.3 Phases of the project

The project was concluded in different phases. This means that once the first part was finished, the project team was able to move to the next part in digitalization. Next, all the main phases are named, and actions taken introduced.

5.3.1 Starting phase for the project

The first phase started when the need for digitalization of forwarding was acknowledged during the first months of Covid-19. However, very little was done afterwards, until the writer of this thesis brought the idea of digitalization back up again. During this quiet time, only few discussions were held related to the digitalization due to other more urgent issues with the pandemic when the company was trying to survive with the constantly changing regulations and environment. Once the number of covid-19 regulations decreased the writer of this thesis brought the idea up and started the discussion with

his manager about the subject, who approved the idea of this project. Quickly afterwards, it was decided that the company will proceed with the project in question and a date for the kick-off meeting was decided.

The attendants of the meeting were decided according to their roles in the organization which could be crucial related to the project and its effects to the operating models of the company. The attendants were from the forwarding team, shipping & packing teams, IT system developers and the responding managers of those teams. During the kick-off meeting, the guidelines, and directions where the project was headed was discussed from the perspective of all parties related. Hence, the discussions lead to preliminary decisions that what should be included, and what excluded from the project. The preliminary goals of the project were to significantly decrease the amount of paper needed in the forwarding, and to study which countries or customers require original documents on paper to accompany their shipments. Furthermore, calculations of how much time, money and resources are saved each month due to the improvement done to the forwarding process were among the points of interests from the managers. Also, it was concluded that system updates and changes were needed for the forwarding team to be able to continue their work without any paper and movement between the forwarding and shipping teams.

5.3.2 Improvement of tools

Planning of the project began with getting familiar with the subject in question. The forwarding team had to determine what they had, and what modifications were needed to their operating systems, to be able to continue with the project. As mentioned earlier, forwarding team is using SAP application to book almost all their shipments, using a specific work queue designed for their purposes. Therefore, it was concluded that the ingredients for paperless forwarding were already there, but the systems just needed a bit of amendment to work properly.

Forwarding team is using a specific transaction in the SAP interface, later referred to as shipping queue as described in chapter 5.1.1. Already, in the beginning of the project, this queue could be used alone to operate the forwarding function. However, to create shipments using only this SAP queue, would still have significant challenges within. This meant that the system needed to be upgraded into more user-friendly version, which could be used alone in the future to book shipments. First, the researcher and forwarding team started gathering thoughts what the queue was missing, what could perhaps be removed and overall, how the usability could be increased. There were number of problems with the system, such as the fact that the system was showing all open orders in the system, even those which were not ready to be dispatched. Therefore, it was challenging for the forwarding team to spot which orders were ready to be shipped. Furthermore, there was only a small possibility to sort the queue according to dates, countries, shipment types and so on. Other problem for the queue was unnecessary information on the system view. There were for example several “short-cut” buttons which were never used while operating the queue. And with those buttons which were used, there was information missing. Since the goal of the project was to get rid of the paper the shipping team was bringing to the forwarding team, the team tested how it could operate solely with the shipping queue for one forenoon. The testing was a success, and the researcher and the forwarding team was able to spot all the complete orders even without any developments in place. This meant that suggestions for improvement to the system specialists could be given, who could then start working on with those improvements.

5.3.3 Requirement of shipping invoices

As explained in chapter 4.3 and 5.1.1, forwarding is creating invoices for their shipments to be used in custom purposes and for the recipient to create the payment for their ordered products. For shipments going outside of European Union, meaning that customs procedures are being applied, the forwarding team was required to send three, or more invoices with the products depending on the requirements of each country. Furthermore, one invoice had to be printed out for the archiving purposes as explained in chapter 5.3.8.

This meant, that minimum of four invoice copies were printed out for all courier shipments being sent outside of the EU being one the places where most paper copies had to be printed for a shipment.

To find more about the requirements for invoice print outs, the researcher contacted the contact person in one of the major transport agencies in the world to find more about the issue. In this conversation, the contact person introduced an “Paperless Trade” function, which is working with SAP and nShift systems, with their shipments. However, there were some exceptions, but this function was working with most countries outside the European Union. This function enabled the electrical transformation of documents from the shipper to the transport agency, meaning that the requirement for printing of physical invoice documents could be stopped in most of the shipments. However, since the “Paperless Trade” function was still new tool for the researcher and forwarding team, discussion was held with the nShift system specialist who also helped in other parts of the same project later. The specialist explained that the function will work almost as non-detected with the shipments and will allow the removal of physical invoice documents when activated. Furthermore, the specialist also suggested that an automatic booking email should be activated, since earlier the forwarding team had to create booking emails for all shipments going outside of EU. This change was one of the key improvements, since it made the next phases possible in the project when the amount of printing paper was decreased.

Besides the transport agency capable of using this “Paperless Trade” function, the forwarding team is using one other transport company for their courier shipments. After a discussion with their contact person, the researcher found out that they do not have a similar program, but an agreement was made that only one physical invoice copy was needed to be attached to the packages with their shipments. Therefore, even though it was not possible to get rid of all the paper being printed, it was possible to decrease the amount of invoices being printed from three copies to one copy. Since the average length of each invoice is approximately three to four pages, it still makes a significant decrease

in the amount of paper used when all shipments using this transport company are considered.

5.3.4 Learning visit to other ABB unit

ABB Oy is a large manufacturing enterprise, which has activities in different industries, such as protection relays, motors & generators, and various other divisions such as electricity transmission and distribution systems. (ABB, 2022). In Vaasa, there are numerous other divisions located just next to the facilities of the commissioning company. The project team was aware that one of these other units had more advanced shipping system and their digitalization was more advanced than ours. Hence, a visit to their facilities was arranged to learn about the different possibilities what could be adopted to our unit as well. Even though, there wasn't any direct copy's which could be adapted to our operating systems, there still were some significant takeaways, one of these being the fact that the other unit printed their shipping documents directly to their shipping area, which could be placed there straight to the packages.

5.3.5 Introducing shipment booking to the shipping personnel

As mentioned earlier, almost all the shipments are booked using an SAP software. However, there are some shipments to Finnish recipients, such as subcontractors, which are not opened to the SAP interface. This forced the researcher to seek for alternative solutions for those shipments, since they are not visible in the work queue the forwarding team is using. In the beginning of the project, the process of making these shipments was time consuming and involved forwarding as well as the shipping team. Since, these shipments are being sent to recipients in Finland, usually suppliers, the significance of these shipments to the revenue of the company is small but was still requiring a significant effort when compared to shipments to actual customers with high sales. To improve this process in particular, the parties of the project started mapping how this process should be improved from different perspectives. Early in the year of 2022, forwarding team started counting the amount of shipments outside the SAP system. The team found

out that the number of these shipments is marginal. As it was clear that the unnecessary movement between the shipping area and forwarding had to be get rid of, this was one of the easiest places to start. The researcher with the help of colleagues came up with a solution, that all these shipments should be removed from the forwarding team and added to the responsibilities of the shipping team. This was relatively easy decision to all parties, including the shipping team since they were already compiling the packing lists of these shipments by hand. Hence, the only change being the interface where the employees added the delivery information, such as dimensions and product descriptions.

The process of changing the responsibilities of these shipments started from the consultation of nShift professional, who oversees the functionality of the nShift system. After a conversation with the system specialist, it was agreed that access to the nShift software should be granted to a group account the shipping team was using to log into the SAP interface, as well as to one contact person from the shipping team who had been helping with the process itself from the start. The need for rights for one person was needed for uploading and updating of the nShift system, since the system was not capable to grant modification rights for group accounts.

After the conversation with the nShift specialist, it was clear what was needed to complete this part of the project. The process began by adding system rights to predefined person from the shipping team, as well as to the joint user the shipping team is using inside the shipping area to the nShift system used to book these shipments. Furthermore, two separate printers had to be installed to the shipping area, one normal printer for the waybills in A4 size, and one special printer for package labels. After a consultation of system specialist, the researcher and the project team knew that there were already printers available for this purpose, which meant that it was not necessary to order any new equipment. Hence, the company was able to save recourses when already existing equipment could be re-used. Following the acquiring of these devices, and relocating them to the shipping area, the nShift software was downloaded to the shipping team's computer using specific guidelines received from the nShift specialist. Simultaneously,

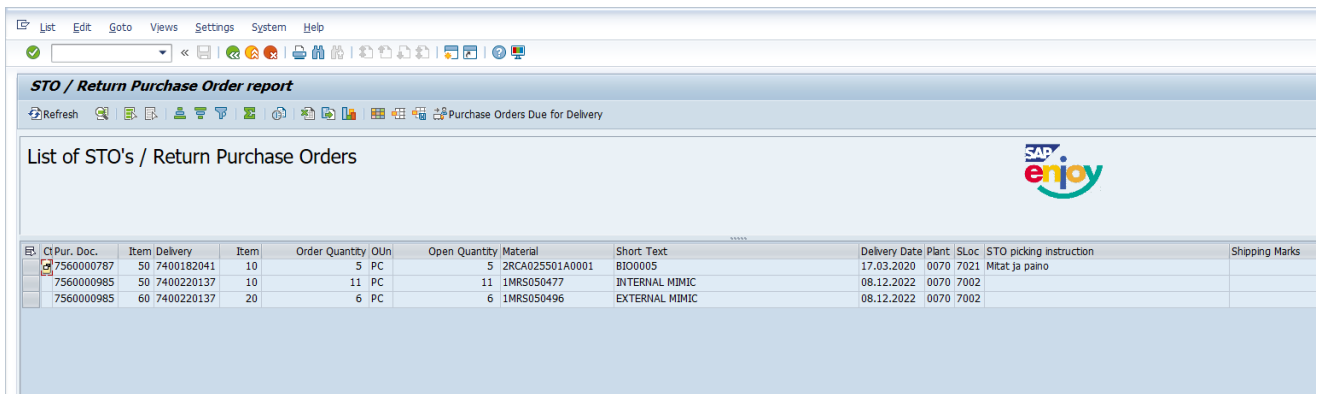
the writer of this thesis created a new guide to the use of nShift software including the booking of these shipments. This meant, that the testing for the functionality of the new systems and printers could be started and beginning on implementing the new process.

Following the first testing, the documents printed from the computer in the shipping area, were printed automatically to the printers located next to the forwarding team. This meant, that there was a problem with the IP-addresses with the printers or within the newly created account in the nShift system. After a quick review, it was clear that the printers were not able to connect to the computer and to the nShift system but were still online, which caused the initial problem. Following a check-up from printer and electricity specialist it was clear that the printers were not connected to the network properly. Furthermore, since the nShift system was not able to connect to the printers, consultation with the professional on changing the main settings for the system itself was needed. In this change, the specialist also added a specific right's for certain transport agencies for the newly created account in nShift, which meant that they could book shipments for these specific transport companies. Following these changes, the system was tested again which was a success. The shipping team was able to create shipments using their own computer, printers and credentials all located inside the shipping department.

5.3.6 Supply chain returns & shipments from external location

As introduced in the previous chapter, there are shipments which are not visible in the SAP interface and cannot be booked from the shipping queue, the forwarding team is using. However, there are also two separate shipment types, which are opened in SAP, but cannot be seen on the shipping queue. These are supply chain returns and shipments from external location, usually in a different country. Supply chain returns are shipments of goods, which are being returned to the supplier due to quality issues for example. When the quality department decides that certain products are needed to be returned to the supplier to be fixed or replaced, they create a reclamation in the SAP interface and contact the buyer responsible of this supplier, and then return purchase order for the return is opened with the supply management team. After the buyer has contacted

the subcontractor of this product and agreed that the product will be returned, packing department will pack the goods as explained in chapter 5.1.3 and deliver the packing details and picking list to forwarding team in person and on paper. However, these shipments cannot be seen on the shipping queue, but instead have a different queue in a separate SAP transaction where only these shipment types are visible. Screenshot of this queue can be seen in figure 9.



Item	Pur. Doc.	Item	Delivery	Item	Order Quantity	OUn	Open Quantity	Material	Short-Text	Delivery Date	Plant	SLoc	STO picking instruction	Shipping Marks
	7560000787	50	7400182041	10	5	PC	5	2RCA025501A0001	BIO0005	17.03.2020	0070	7021	Mitat ja paino	
	7560000985	50	7400220137	10	11	PC	11	1MRS050477	INTERNAL MIMIC	08.12.2022	0070	7002		
	7560000985	60	7400220137	20	6	PC	6	1MRS050496	EXTERNAL MIMIC	08.12.2022	0070	7002		

Figure 9 Queue for supply chain returns

Since the idea of having two separate queues for shipments is not efficient, the decision was made by the researcher after a consultation with order handling manager, that these two queues should be combined, so that in the future all the shipment types would appear on the same queue. Unfortunately, after a conversation with the system specialist, such combination was not possible to be implemented due to differences within the order types of normal shipments and supply chain returns. However, since the requirement was to get rid of the movement of paper between packing and forwarding department, the researcher continued the discussion with the system specialist to find a solution for the problem. After a discussion about the alternatives, it was decided that a “Notify shipping” button should be added to the supply chain return queue (Figure 9) which would automatically notify the forwarding team once the return shipment has been completely packed by the packing function, hence removing the need for physical papers to be delivered to the forwarding team.

The second shipment type which cannot be seen in the SAP interface and is not visible in the shipping queue are shipments which are shipped from an external warehouse, operated by a supplier in a different country directly to a customer. The process of this shipment type has significant differences when compared to other shipments, since these goods are never physically in the factory premises. The process for these shipments is somewhat similar than with supply chain returns. In this shipment type, the packing function sees that this shipment type appears on their own shipping queue, indicating that the shipment needs to be booked and shipped. At this point, they would print the picking list and deliver it to the forwarding team, where the forwarding team would start the discussion with employees in the other country to create the shipment. An easy solution was made that in the future packing team would no longer print out the picking list and deliver it to the forwarding team. Instead, they would just send a notification via email that one of these orders has emerged on their queue and it needs to be shipped as soon as possible.

5.3.7 Launch of paperless forwarding

In the end of 2022, the researcher, and the managers of forwarding and shipping, decided that the process of hand delivery of papers to forwarding should be stopped starting from the beginning of January in 2023. The forwarding process before the changes was explained in chapter 4.3. This meant, that the movement of papers was stopped, and the forwarding team had only the shipping queue in SAP to rely on, when booking shipments. Furthermore, since two new employees started on the same day in the forwarding team, they were taught how to operate in the new way from the beginning. Due to the new operating method, the forwarding team had to find new ways of doing their work, since earlier they could rely on the picking lists and packing details documents in a physical form for the delivery information needed to book shipments. However, in the beginning there was not a solution for supply chain returns and shipments from external location explained in chapter 5.3.6, which is why those shipments still had to be delivered by hand to the forwarding team. Furthermore, since the forwarding team was not receiving the packing details document from the packing department due to the change,

forwarding team had to print the document from their own computer. However, the packing details document was still being printed in the packing department since the SAP system automatically creates the document when the delivery has been saved. This meant that there was an extra document being printed, even though the movement between forwarding and packing functions was stopped. To stop the printing of one extra document, it was decided that the packing details document would be added straight to the package once it had been printed in packing. However, there was a problem since the shipping team used this document and the bar code on this document to locate and identify packages and match them with the documents. For this improvement to take place, the researcher asked from the SAP system specialist that a similar bar code should be added to the packing list, so it could be used solely to locate each package. This would turn out to be a significant assistance to the shipping team because the initial plan was to print out all shipping documents straight to the shipping team premises, as the other ABB division was already doing as explained in chapter 5.3.4.

One of the last issues blocking the digitalization process and improvement of the forwarding function, new working procedure was needed for the delivery of documents to the shipping team. Earlier, as explained in chapters 4.3 and 5.1.3 the documents were delivered and collected from a specific place next to the forwarding team. As the delivery of the documents was successfully stopped and changed to a digital version inside the SAP system, something was needed to be done for the collection of the documents. Hence, due to the new printing devices installed to the shipping area during the introduction of shipment booking to the shipping personnel in chapter 5.3.5, the writer of this thesis with colleagues from the shipping team decided that it would be reasonable to print the shipping documents directly to those devices, so the documents would be directly available for the shipping employees next to the pallets and cartons for which they needed to be applied to. In that regard, testing period for this process was agreed for week 6 of 2023, where the writer of this thesis changed the printer settings so that shipments to two specific countries agreed with the shipping employee were printed directly to the shipping area. These two countries were countries in European Union,

with high daily volumes for the testing to be sufficient. Furthermore, the countries were from EU due to their low requirement level of invoice description texts, documents and so on.

The testing period was two days, and during this time no major issues were recorded. However, there were three key issues which would have an effect to the fluency of the work in the forwarding team, as well as with the shipping team. The first two reasons are related to the printer settings. Since a similar label printer is located next to the forwarding team, it's determined as the default printer. This means that without changing the settings, the label would be automatically printed to that printer. However, the solution for this problem is easy. Once, the decision is made to change the process completely that all the documents would be printed to the shipping area, the default settings are just changed accordingly. Furthermore, during the testing, the forwarding team still had a requirement to store physical invoice documents to folders, which meant that some of the documents had to be printed to the printers in forwarding, and some to the printers in the shipping area, which caused the issues of changing printers between printing. The third issue was related to the packing details documents, which was introduced in earlier in this chapter. The issue was that this document still needed to be printed, because the solution with the barcode to the packing list document wasn't available at this moment. Therefore, this document was also printed directly to the shipping area, with the packing list and shipping label. According to the shipping employee, the only major issue with the printing directly to the shipping area was the packing details, since due to that document the amount of paper sheets was almost multiplied, which makes sorting the documents with the same shipment more difficult. Hence, in the preferred solution only packing list and shipping label were printed to the printers in the shipping area.

5.3.8 Digitalization of invoice archives

In the next phase, discussions were held to figure out what would be the most reasonable way to proceed. After observations, a clear direction was decided since there was

still an old operation model in use which should have already been removed from active use. This was the physical storage of custom documents for accounting purposes, such as the invoices created by the forwarding team introduced in chapter 4.3 and 5.1.1. In the beginning of the project, there was a requirement that shipping invoice and picking list for the products had to be stored for 6+1 years in the company storage for accounting reasons. This meant that for every single shipment, forwarding had to print out one extra invoice copy to be stored in paper holders, which would afterwards be moved to a storage facility. In this storage, the holders would be stored for six years plus the current year, before they could be thrown away. After a review, physical storage was seen as an expired way of storing accounting documents. Hence, a meeting was held to figure out what would be legal requirements for an online archive, and what could be the potential place where these documents could be stored, which would meet the regulations. In a meeting held in October 2022, the researcher and managers from functions affected discussed these issues with experts from IS infrastructure team and decided that this process was worth going forward with. A list of questions was created to be asked from ABB Oy's own Transport Management Center (TMC) to learn more about requirements from a legal and company perspective. These questions were planned to get answers if there are any legal requirements with the archiving of custom documents, such as invoices from Finnish customs for example. Furthermore, information about the requirement of documents that needed to be stored or should there be documents stored in the first place was needed.

Next, a meeting was held with specialists from those functions most affected and most familiar of the issue as introduced earlier in the chapter. It was found out that according to Finnish customs, the archiving is mandatory and needs to happen at the facilities of the exporter. However, the archiving can be done in a physical form as paper, or electronically in a system if the document can be maintained in a non-changed state, and printed out, when necessary, in the same format as it would have been as physical paper. (Hartikainen & Lillman, 2016). Furthermore, the researcher found out that picking list was just an internal document and did not have to be stored, which meant that the only

document which needed to be stored was the invoice used in every shipment with customs when shipped to non-EU country or just with the invoicing of orders to customers in EU shipments. Furthermore, the archiving requirements were also ensured with a discussion with ABB Oy's own attorney to make sure that nothing was forgotten when the decision would initially happen.

In December of 2022, a third meeting was held with the same group as earlier concerning the invoice archiving. In this meeting the discussion concerned the possible location/software which could be used as archive for the invoices. There is a system in the SAP interface, called DMS, which is currently used for documents which are used in connection to customs clearance, meaning the shipments created by the forwarding team using airfreight. These documents include the same invoice which is planned to be entered to the system in the future. However, there are few problems. First, the documents are currently added to the system manually, which would not be efficient if it would be needed for every single shipment the forwarding team is creating. This meant that a system development would be required for this to be possible in the future. However, before the system development could take place, due to the significance of the decision related to the major change in operating methods and in the system itself, a calculation of the annual savings of paperless archives was required. This would also help different parties inside the organization to truly understand the significance of this change, and the process could therefore be speeded up.

Once the savings calculation was finished, and other information related to the change was figured out, it was possible to continue the process. A meeting was held, which was participated by all the persons who had been in the previous sessions, added with those who were in decision-making positions, for such modification to be approved. In this meeting, the savings calculation was presented, and the researcher explained through the numbers why such change would be beneficial for the company. Especially since the changes were applicable to other divisions of the commissioning company as well. The electronic archiving would also improve and ease up the access to old shipments, and

with the possible savings gained from the improvement, proved the significance of this part of the project. In this meeting, all the parties, including the researcher, managers, system specialist and end users agreed that the change was significant enough to proceed with. Furthermore, it was decided to gather up information from other ABB divisions, since the researcher had learned in the meeting that there were possibly some functions that were already utilizing electronic archiving. This meant, that the researcher wanted to know if other divisions had a similar approach to archiving. An inquiry was sent to two other divisions, and according to the inquiry, those two ABB divisions were already utilizing electronic archiving. This meant two things, first, the unit where the researcher is working had fallen behind in development and secondly, there was already an electronic archive up and running. Hence, the only requirement at this point was to change the system and procedures at the commissioning company in a way that also the invoices and documents of the commissioning company would be electronically archived in the future.

According to the inquiry made, those two divisions of ABB, were utilizing the DMS software in SAP, mentioned earlier for invoices used in connection with customs clearance. They were also using an invoice archive called Case-M, for invoices created for the shipments to EU countries or domestically. The commissioning company is already using both software's but had clearly not understood that these could be used for the purpose of archiving invoices used with shipments in forwarding. From the information received, the forwarding function and the researcher could start working with the changes needed in those systems and adapting the new archiving method into everyday use.

5.3.9 Preparation of savings calculations

In every change made, one of the key indicators that a change has been successful, are the savings it has created in resources. Therefore, the researcher with the help of packing employee and manager responsible of shipping and packing measured the time it takes for one single shipment to go through the process from packing to forwarding and to the shipping area. To measure the change with this project, we started to measure the time

from the moment the shipment was completely packed in the packing function to the point where the physical documents were delivered to the forwarding team to take into handling. Then, the researcher estimated what is the time it takes for the forwarding team for the handling and printing of the papers which was added to the total time. The handling included the pickup of the papers from their box where the packing employee had left them, the walk back to the employees' desk, the handling of the papers once they were printed, including stacking and stapling, and the placing of the papers back to their box where they would be ready to be picked up and delivered to the shipping team. For the last part, the shipping employee had to walk from the shipping area to the forwarding team, collect the papers, and walk straight back to the shipping area where the packages were located. After this test, the researcher knew what the combined time was what it took for one shipment to go through the whole process, without any modifications in the SAP system.

The archiving process was also included to the calculations. The time, which is spent for the daily task of archiving, which means the collection of all the printed invoice copies and placing them into their specific folders for the whole forwarding team was estimated. Additionally, once forwarding has filled enough folders, the folders are placed inside carton boxes and delivered to a storage room. This process is performed few times every year. Additionally, at the same time as folders are being delivered to the storage, the storage is also being emptied from those documents which have already fulfilled the 6+1-year storage requirement. For this task, outside help is hired for faster transition of the papers from their folders to security disposal dumpsters. With all these calculations, the ability to calculate the saved time for each shipment was achieved.

The other point of interest with the savings, was the amount of paper and supplies used in the forwarding team. To measure the effect of the changes made throughout the digitalization process, the researcher contacted the Supply Chain Management (SCM) team to find out what is the costs of printing paper used in printers, what is the costs of paper folders used to store invoice documents printed in the forwarding team and what is the

cost of ink cartridges used in the printers. The total number from these calculations can be used to calculate the average savings per each shipment which is using the newly introduced paperless trade method with courier shipments. However, to find out the average amount of paper saved for each shipment, the researcher created an excel file, to figure out what is the amount of paper sheets saved in each shipment. The average number was calculated by using two figures during a period of two weeks. First one was the amount of paper sheets used before the changes, and the second one the number of paper sheets used after the changes. After deduction of these two figures from each other, the researcher was able to calculate the number of saved paper sheets per one shipment on average.

Also, since one of the key areas of improvement, is to get rid of the physical storage of invoices inside the factory of the commissioning company, it's important to also calculate the costs of invoice folders which are used each year. From the invoices printed in the forwarding function, one invoice from each shipment of each shipping date is placed in a folder. In most days, the folders are filled only with invoices from that specific date. However, whenever the number of shipments is low, invoices from different days are placed inside the same folder with the invoices from previous dates. Since the number of working days in 2023 is 251 days Edenred (2023) the employees in the forwarding team estimated that approximately 210 folders are used each year to store invoices. Furthermore, the forwarding team estimated how many cartridges they use in a year. With the number of invoice folders used and with the calculated decrease of paper sheets, it was possible to calculate the saved amount of money as the use of ink cartridges and invoice folders.

From the shipping dashboard of the commissioning company, it was possible to calculate the number of shipments in 2022. From all the shipments in 2022, the researcher sorted out all the shipments which were using those two transport companies which were the two targets of paperless forwarding due to the large number of invoice copies needed for these courier shipments. Since some countries require invoice copies for their

shipments, those were excluded from the calculations. Furthermore, few countries do not accept courier shipments which is why they were not included to the calculations. Therefore, after these actions, the researcher was able to calculate the number of shipments in 2022 which could utilize Paperless Trade or new invoice requirements agreed with the transport companies. This number was used to calculate the amount of saved paper sheets per year by multiplying it with the average number of saved paper sheets per shipment for these shipment types.

The commissioning company has security document dumpsters, which are emptied, and the papers are disposed at regular basis. Since the forwarding team is responsible for large number of disposals of paper, due to mistakes, cancellations and so on, the decrease of paper due to the project causes that far less dumpsters less are being emptied every year. Furthermore, significant number of dumpsters are filled up every year with old documents from the invoice storage. Due to the changes, the dumpster next to forwarding does not fill up as quickly, meaning less dumpsters every year.

Furthermore, the actual disposal of the papers is calculated on top of the other expenses made during the disposal process of the papers. Furthermore, since the number of papers and folders used is decreased, it has a direct effect to sustainability. According to sustainability specialist the carbon footprint of the papers and folders can be calculated using the figures from saved paper sheets and saved invoice folders. The calculations were made using SimaPro-software using company databases. The figures entered were the same ones mentioned earlier, such as the calculated amount of saved paper sheets, folders, and the delivery of those goods to the factory from supplier. 427 kg of CO₂-eq was released before the changes, which therefore means that, approximately 427kg of CO₂-eq will be saved after the changes.

6 Key improvements for the order-delivery process

This chapter will present all the key improvements of the changes initiated in the previous chapter by mirroring the results achieved through theoretical framework of this thesis. Furthermore, to truly reveal the significance of these improvements, places of savings made of the tangible and intangible things in various functions are presented. Additionally, proposals for further research related to the changes and their follow-ups are presented in the end of this chapter.

6.1 Overall benefits for various departments

The digitalization project performed during this thesis made significant changes and improvements to numerous working methods, especially in the forwarding team, but also with the packing and shipping teams. Furthermore, the improvements made due to digitalization had an effect inside the commissioning company on a wide scale. This section will go through all the improvements made to each function in detail, continuing from the findings and project descriptions presented in chapter five.

6.1.1 Forwarding

Improvement of the shipping queue was one of the key points of improvement since it enables the forwarding team to be working without physical paper, and remotely if needed. The shipping queue was cleared of unnecessary material, which were detected in a research session involving all the employees of the forwarding function. Furthermore, new features were added to the queue, which made the use of the queue simpler. These features were sorting tools, such as sorting the orders according to countries, shipping types, dates and most importantly, adding a feature which would only show those orders which were already packed physically and in the system by the packing team. This decreased the length of the queue, which enabled the employees of forwarding to see all the orders which were ready to be dispatched. In figure 10, it can be clearly seen that the length of the shipping queue has decreased, when the cursor in the right side of each

packing department to provide the picking lists to them anymore. More about the calculations related to savings in time and money will be discussed in chapter 6.3.

The purpose of digitalization in organizations is to increase their level of competitiveness, improve their digital technology capabilities and create new methods of creating customer satisfaction. (Verhoef, et al. 2021). Furthermore, one significant motivation behind digitalization is to decrease the amount of manual labor and lead times, which therefore can be seen as increases in competitiveness. Hence, one key aspect for this thesis was the decrease in lead times of the forwarding process, inside the order-to-delivery process.

The forwarding team was keen to see the improvements made, since they acknowledged the goal of this project. However, between the various improvements made, there were phases where some of the operating models were temporary, which could cause misunderstandings and increase the difficulty of certain tasks inside the forwarding function. However, since eventually the goal was to create a faster and more efficient forwarding function which could operate independently in terms of location the team was looking forward for the changes made.

The last major change made through the digitalization process was the decision to move into electronic archiving of the shipping invoices the forwarding is creating and using. According to the inquiry presented in the last chapter, other divisions of the commissioning company were already utilizing such approach, which meant that the commissioning company had to catch up with the other divisions with the archiving procedure. Even though the change created cannot be used in all the divisions of the commissioning company, there still might be some divisions which could utilize the same approach from this project. The reason why the commissioning company had fallen behind in development is twofold. First, these other divisions which were already using the electronic archiving, are using the services of ABB Oy's Transport Management Center which is responsible and helping with the forwarding, customs, and shipping of the products of

these other divisions. The commissioning company where this thesis is assigned, is not which means that on some occasions the information is not moving as seamlessly as it should demonstrating the importance of good information flow. Secondly, the commissioning company could have started the process of electronic archiving sooner on their own but lacked the motivation of seeing the process through presented also as a key aspect in figure 2 with the steps of action research process. Due to the length of the process of moving into electronic archiving including the system updates and releases, changes in operating methods and guidelines, the result of this improvement is not included into this thesis. However, it is important to remember that due to the actions and decisions made during this thesis, the process of moving into digital archiving was finally initiated after a long delay.

6.1.2 Packing and shipping department

One of the first key improvements to the process, was decreasing the lead time of shipments outside the SAP system. As explained in the chapter 5.3.5, the process from shipment request to the actual shipping required many employees, delivery of documents across the facilities, not to mention the time needed for this process. Change of moving these shipments to the responsibility of the shipping team was implemented on the beginning of November of 2022. In the future, the responsibility of creating these shipments belong to the shipping team, which decreased the lead time of the whole process and enabled the project to move forward. Before the changes were made, the atmosphere was sort of negative, since the shipping function thought that there was just another responsibility added to their workload. However, after explaining that the change saves time from their own tasks and speeds up the departure of the shipments, the employees understood the benefits of this improvement.

The second key improvement is related to the packing details document, which was earlier delivered to the forwarding team by hand, and printed double during the period where the teams had to wait for the IT-specialist to modify the packing list document so it would have similar features as the packing details document. After an SAP production

release in March of 2023, the barcode needed for the packing list document was added and the shipping team could attach the packing details document straight to the package once it was printed out from their systems. This also helped with the amount of documents related to the relocation of printed shipping documents. This improvement was well received, since it did not really have a huge impact to the workload of neither teams. It was mainly just a modification to the operating methods than just adding new tasks. The third key improvement was the decision to start printing the packing lists and shipping labels of shipments to European Union directly to the shipping area, to decrease the movement between the two functions as much as possible. Hence, majority of the unnecessary movement due to printed documents was removed from the working procedures. However, some documents had to be left for the responsibility of the forwarding team, since there still are numerous customers which require an actual physical document, with signatures and stamps. Furthermore, it is important to remember that improvements to lead time of one function cannot be achieved just by changing the responsibilities of certain tasks. This is why some procedures must stay as the responsibility of the forwarding team and not just forwarded into the next function, even though it might mean that all the goals would not be achieved as planned.

Parallel to the digitalization project in the forwarding, there were two other projects ongoing at the same time, mostly inside the packing and shipping functions. These were RFID outbound system and portable Fiori-scanner for barcodes. RFID outbound is a gate at the exit of the shipping area, which automatically reads the packages once they exit the facilities and is therefore gathering data to the system of shipments which have left the premises. The barcode reader was introduced to decrease the possibility for mistakes since earlier the employees had to read the information from the packages themselves. This is especially important since as part of the improvements made, shipping documents are printed straight to the shipping area. Even though these two projects were not part of this thesis, they all work together to ensure higher level of automation and digitalization. Overall action research process described using the same figure as figure 3 is presented in figure 11 to clarify how the whole process went through inside the

commissioning company. Furthermore, the schedule of the changes made are also added to the figure to clarify the time needed to carry out the changes and thus revealing the significant effort of digitalization process.

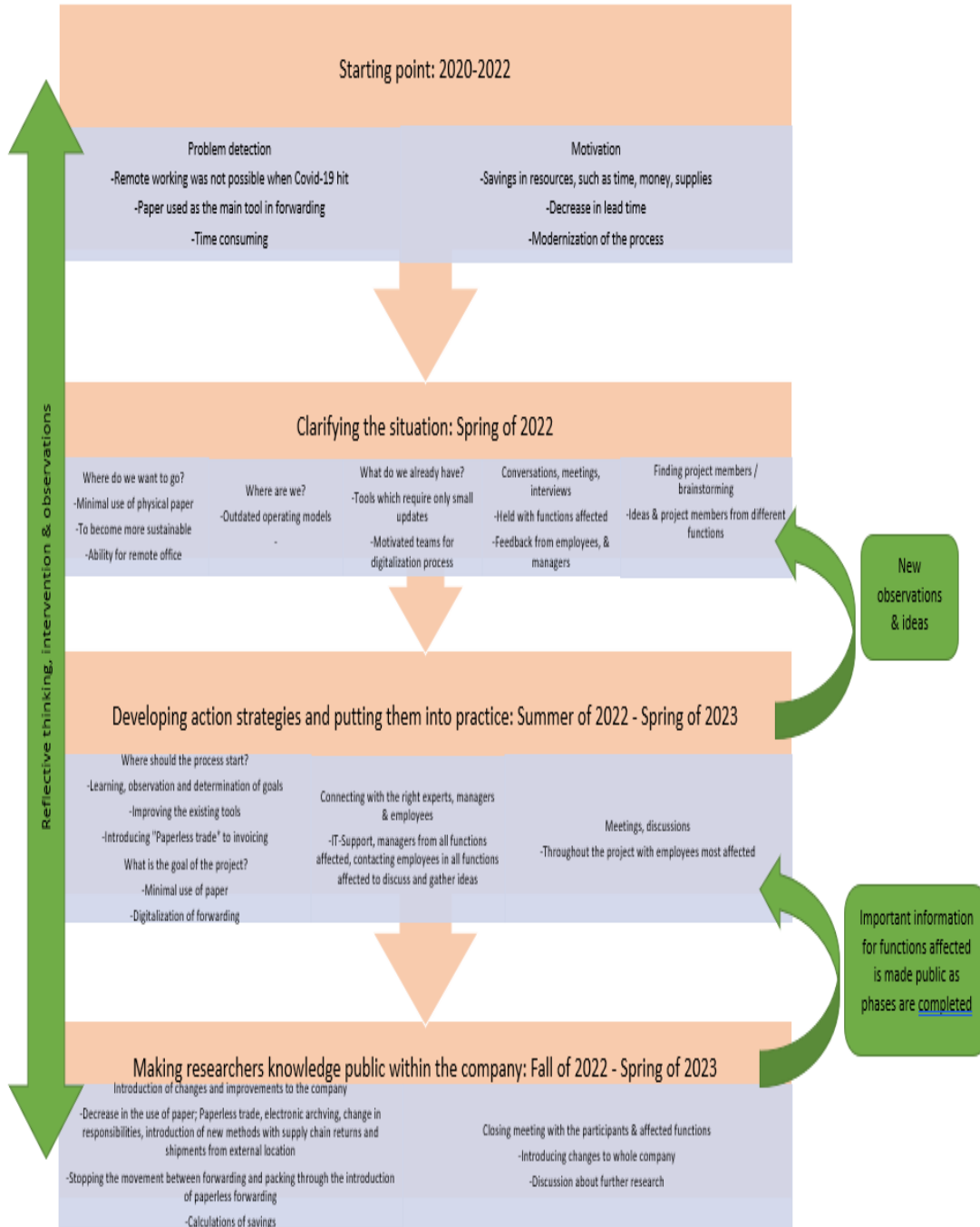


Figure 11 Overall action research process

6.2 Savings throughout the project

ABB Oy, as a company has a policy that an official savings calculation needs to be conducted for projects which requires an official declaration of savings achieved. Therefore, calculations and an official project savings document had to be done. This document contained the basic description of the digitalization project and its goals and objectives. In addition, calculation formulas from savings gained in numerous functions were described in this document. These were calculations in operator costs at packing and forwarding. This document, with all the calculations made during the process, was given out for the commissioning company to determine what were the key areas of improvement and the number of savings made throughout this project. The savings made in time, resources needed to operate the forwarding and shipping functions and the with the removal of information security dumpsters were among the points of interest.

From all of savings made in each function and operational tasks, the lead time of orders throughout the whole order-to-delivery process decreased, especially from the forwarding's perspective. Furthermore, due to the introducing of paperless trade program and the agreement made to two of the transport companies the forwarding team is using with the highest volume, it was possible to reduce the amount of printed invoices significantly. According to a follow up measurement presented in chapter 5.3.9, the forwarding function was able to save a significant amount of paper sheets for every shipment going outside of the European Union using courier shipment types. Furthermore, there is a significant amount of time saved for each shipment which is using the improved digitalized version of forwarding and shipping processes.

All the changes made lead to a significant number of papers saved each year which works hand in hand with the environmental and sustainability goals the commissioning company has. Due to all areas of savings presented in chapter 5.3.9, the commissioning company alone can save a significant amount of money and resources annually, added with the saved amount in carbon footprint, which was 427kg of CO₂-eq. However, since there was interest to this project from other ABB Oy's divisions as explained in chapter 5.3.8,

the information gained in this project can be applied to other divisions as well because the calculations made clearly indicate that significant savings can be made from these digitalization changes.

The savings in tangible, and intangible resources can be directly linked to the theoretical factors and strategic aspects, in why companies choose to go through digitalization. As explained, one of the most common reasons why companies want to go through digitalization, are the benefits it brings in saving money, resources and thus developing the company through digitalization. Furthermore, sustainability as an aspect has been on the rise for a long time as mentioned earlier, which is why it's one of the most common reasons for companies to invest in digitalization. All of these were mentioned in the theoretical part of this thesis as the key benefits, and all of these were achieved through the changes made during the digitalization process proving the connection between theory and practice.

6.3 Proposals for further research

Since the objective of this thesis and the digitalization project performed during the thesis was mainly concentrating on the forwarding function, there still is a significant number of processes inside the commissioning company which could be driven through the digitalization process. One of these is the packing function, which is the closest to the forwarding function. As mentioned earlier in chapter 4.3, packing function delivered picking list documents to the forwarding team when orders were finished from packing. Even though forwarding has gone through the digitalization process, and the number of documents needed in physical form are significantly decreased, this document is still being printed by the employees in packing. They use this document as a guide to gather up the required products and material for the shipments. This process was explained in more detail in chapter 5.1.3. Since packing employees already have barcode scanners which they use to identify packages through the documents provided by the forwarding, a project could be made to increase the amount of these scanners and modify their purpose so these scanners could be utilized also in the collecting of the materials. This way

the packing function could decrease the amount of printing paper they require in their daily tasks. Furthermore, related to the amount of printing paper across the different functions in the commissioning company, it might be reasonable to systematically study the working methods of different functions and identify if there are any methods which still require printing paper, and if it could be get rid of.

Following the changes made throughout the forwarding and packing functions, it could be useful to create a follow-up questionnaire to find out what are the difficulties with the new system or is there room for improvement somewhere inside the process. The most major changes of this project were designated to the courier shipments since that was the place with the most unnecessary printing. However, an overall review of the forwarding function, where all working and shipping methods are reviewed and questioned could be useful for the overall improvement of the function. This same process could be then applied to other functions to decrease the amount of outdated operating procedures.

As explained in the previous chapter, the changes made through the digitalization process saves a significant amount of time in a year for the whole forwarding team. As the changes and new operating procedures will be fully adopted to the team, the team will be operating on a much higher speed and more shipments will go through the team. However, since most of the duties of the forwarding team is related to the shipment booking and invoicing, it could be reasonable to study the operating methods, duties, and workload of the team to figure out what is the adequate amount of employees needed to run the team efficiently, since there is a possibility that after all the changes, there is not enough workload for the current size of the forwarding team. On the other hand, instead of reducing the size of the team, the areas of responsibility could be changed to match with the current workload of the time by applying new responsibilities for the team.

As the changes made throughout the action research process of this thesis have had an effect to most of the operating models and methods in the forwarding function, as well as with the packing and shipping function, the update on the work instructions is required. The instructions have been given out to all employees inside the different functions affected, but the official instructions in the various systems are still to be updated. Hence, this process will be one of the most crucial and significant issues which must be done as soon as possible after the process.

One of the tasks of the forwarding function is to create invoices for shipments. Before the changes, these were printed to accompany the shipments, and one copy was printed for archiving purposes. However, some customers and countries still require invoices to be printed, signed manually and then sent to them through express mail. This will be one of the major developments in forwarding after this project. The whole process as it should be questioned, and the benefits of electric signatures and providing the documents through email should be explained, and when possible, switch to electronic communication and signatures with the shipping documents.

One of the key improvements made during this thesis, was the decision to move from traditional, and old-fashioned archiving to online archives for the invoices. Since the project related to the archiving, was estimated to take a significant amount of time due to its size, it was decided that only the decision to go forward with the improvement was to be included to this thesis. This means that in addition to the whole project needed to be completed, there is an opportunity to measure what are the savings and implications on a much wider scale. A review could be made not only inside the commissioning company but also throughout the whole company on Ltd level to see how many different functions could utilize the improvement created during this thesis, and what were the main consequences.

7 Conclusions

This research was concluded as action research, commissioned by ABB Oy's Distribution Solutions function. The purpose of this action research was to guide the forwarding function of the commissioning company through digitalization and through observations and discussions to figure out the weakest points in the forwarding function's operating methods and develop them through digitalization. Simultaneously, the goal was also to develop packing and shipping departments, due to their close connection to the forwarding function inside the order-to-delivery process.

The scope of this research was restricted to the forwarding process inside the commissioning company and related only to aspects which are closely tied with how the forwarding function operates internally and with other functions. Hence, improving the working methods and performance of the forwarding team.

The theoretical part of this thesis concentrated on available literature related to the most meaningful theories of the subject in question. It included the definitions of main concepts used in this thesis, digitalization, digital strategies, and digital transformation for example as well as introduction of the challenges and benefits an organization can gain from digitalization. For example, what kind of challenges company might face when going through digitalization or digital transformation. Furthermore, the theoretical part introduced the technological and sustainability impacts from digitalization as part of the benefits. Even though being a small part of thesis, sustainability is one of the most important issues nowadays when companies in all industries are trying to follow the tightened requirements governments introduce for them.

Using the action research method allowed the researcher to work, study, observe and develop the forwarding and other function closely related during the thesis process as introduced in figure 2 and 4. Throughout the process, there were changes and improvements happening simultaneously with each other which created challenges in scheduling. However, it was mandatory for overlapping in the project since through the

observations the researcher realized that some of the improvements could not be performed without changes in other function. Example of this would be the introduction of shipment booking for the packing employees as well as the changed working methods with supply chain returns and shipments from external location. Without these, it would not have been possible to go forward with the relocation of invoice printing and cancellation of the movement between packing and forwarding functions.

Before the changes made inside the forwarding function, the operating procedures were badly outdated when compared to the rest of the commissioning company, or maybe even on a company level. Afterwards, it was clear that changes were needed since the largest barrier for the changes was only the lack of time and the willingness to start the process.

The project saw different parties across the organization from management to shipping employees. Key parties for the project were the people within the forwarding team, shipping and packing employees with their manager, IT specialists who were in charge for the changes needed in various systems, such as SAP and nShift. In addition, the managers of production and purchasing departments took part to the preliminary planning of the project. All the parties introduced shows what is required from a project of this scale especially when considering the project spreading out for a long period of time.

In the end, as a conclusion and answer to the first research question the changes made during the digitalization process all worked together towards the same goal, updating the forwarding function and the functions closest to it to a new standard. Even though, there still are some issues which needs to be sorted out even after this project, the capability and efficiency of the forwarding team has risen to new standards which is reflected throughout the whole commissioning company, as one of the last pieces inside the order-to-delivery process.

References

ABB Oy, Distribution Solutions. (2022). Älyä ja luotettavuutta sähköjakeluun. <https://new.abb.com/fi/abb-lyhyesti/suomessa/liiketoiminnat/distribution-solutions>

ABB Oy. (2022). ABB Suomessa. <https://new.abb.com/fi/abb-lyhyesti/suomessa>

Agostini, L., Galati, F. & Gastaldi, L. (2020). The digitalization of the innovation process: Challenges and opportunities from a management perspective. *European Journal of Innovation Management*, 23(1). 10.1108/EJIM-11-2019-0330

Akram, U., Fülöp, M., Tiron-Tudor, A., Topor, D. & Căpusneanu, S. (2021). Impact of Digitalization on Customers' Well-Being in the Pandemic Period: Challenges and Opportunities for the Retail Industry. *International journal of environmental research and public health*, 18(14), 7533. <https://doi.org/10.3390/ijerph18147533>

Alrawadieh, Z., Alrawadieh, Z. & Cetin, G. (2021). Digital transformation and revenue management: Evidence from the hotel industry. *Tourism Economics*, 27(2), 328-345. <https://doi.org/10.1177/1354816620901928>

Annarelli, A., Battistella, C., Nonino, F., Parida, V. & Pessot, E. (2021). Literature review on digitalization capabilities: Co-citation analysis of antecedents, conceptualization and consequences. *Technological Forecasting & Social Change*, 166, 120-635. <https://doi.org/10.1016/j.techfore.2021.120635>

Antonucci, Y., Fortune, A. & Kirchmer, M. (2020). An examination of associations between business process management capabilities and the benefits of digitalization: all capabilities are not equal. *Business Process Management Journal*, 27(1), 124-144. 124-144. 10.1108/BPMJ-02-2020-0079

- Baier, M., Lockl, J., Röglinger, M. & Weidlich, R. (2022). Success factors of process digitalization projects – insights from an exploratory study. *Business Process Management Journal*, 28(2), 325-347. 10.1108/BPMJ-07-2021-0484
- Bavrin, A., Koop, V., Lukashevich, N., Simakova, Z. & Temirgaliev, E. (2021). The analysis of digitalization impact on personnel functions in logistics. *E3S Web of Conferences* 258(1). <https://doi.org/10.1051/e3sconf/202125802025>
- Björkdahl, J. (2020). Strategies for Digitalization in Manufacturing Firms. *California Management Review*, 62(4), 17-36. 10.1177/0008125620920349
- Bonnet, D. (2022). 3 Stages of a Successful Digital Transformation. *Harvard Business Review*. <https://hbr.org/2022/09/3-stages-of-a-successful-digital-transformation>
- Brewster, A. (2021). The ultimate guide to the drivers of digital transformation. *Oneflow*. <https://oneflow.com/blog/driver-of-digital-transformation/>
- Broadbent, M. (2018). Seize the benefits of digitalization. *Hydrocarbon Processing*, 1, 27-28. <https://www.proquest.com/trade-journals/seize-benefits-digitalization/docview/2202731933/se-2?accountid=14797>
- Chudaeva, A., Mantulenko, V., Zhelev, P. & Vanickova, R. (2019). Impact of Digitalization on the Industrial Enterprises Activities. *SHS Web of Conferences*, 62. <https://doi.org/10.1051/shsconf/20196203003>
- Ciriello, R., Richter, A. & Schwabe, G. (2018). Digital Innovation. *Business & Information Systems Engineering*, 60 (6), 563-569. <https://doi.org/10.1007/s12599-018-0559-8>
- Correani, A., De Massis, A., Frattini, F., Petruzzelli, A. & Natalicchio, A. (2020). Implementing a Digital Strategy: Learning from the Experience of Three Digital Transformation

Projects. California Management Review, 62(4), 37-56.
<https://doi.org/10.1177/0008125620934864>

Denicolai, S., Zucchella, A. & Magnani, G. (2021). Internationalization, digitalization, and sustainability: Are SMEs ready? A survey on synergies and substituting effects among growth paths. *Internationalization, digitalization, and sustainability: Are SMEs ready? A survey on synergies and substituting effects among growth paths*, 166(1), 120-650. [10.1016/j.techfore.2021.120650](https://doi.org/10.1016/j.techfore.2021.120650)

Eden, C. & Ackermann, F. (2018). Theory into practice, practice to theory: Action research in method development. *European journal of operational research*, 271(3), 1145-1155. [10.1016/j.ejor.2018.05.061](https://doi.org/10.1016/j.ejor.2018.05.061)

Edenred. (2023). Työpäiväkalenteri 2023. <https://edenred.fi/fi/blog/tyopaivakalenteri>

Fleet Owner Staff. (2018). Haven offering automated auditing for freight documents. FleetOwner. <https://www.fleetowner.com/technology/article/21702104/haven-offering-automated-auditing-for-freight-documents>

Frankiewicz, B. & Chamorro-Premuzic. (2020). Digital Transformation Is About Talent, Not Technology. *Harvard Business Review*. <https://hbr.org/2020/05/digital-transformation-is-about-talent-not-technology>

Frey, J. (2021). Here's how digital transformation and sustainability can flourish together. *World Economic Forum*. <https://www.weforum.org/agenda/2021/03/here-s-how-digital-transformation-and-sustainability-can-flourish-together/>

Furjan, M., Tomičić-Pupek, K. & Pihir, I. (2020). Understanding Digital Transformation

Initiatives: Case Studies Analysis. *Business Systems Research*, 11(1). 10.2478/bsrj-2020-0009

Hanelt, A., Bohnsack, R., Marz, D. & Marante, C. (2020). A Systematic Review of the Literature on Digital Transformation: Insights and Implications for Strategy and Organizational Change. *Journal of Management Studies*, 58 (5), 1159-1197. <https://doi.org/10.1111/joms.12639>

Iansiti, M., & Lakhani, K. R. (2014). Digital Ubiquity: How connections, sensors, and data are revolutionizing business (digest summary). *Harvard Business Review*, 92(1), 91–99. https://www.researchgate.net/publication/269764373_Digital_Ubiquity_How_Connections_Sensors_and_Data_Are_Revolutionizing_Business

Inkinen, T., Helminen, R. & Saarikoski, J. (2019). Port Digitalization with Open Data: Challenges, Opportunities, and Integrations. *Journal of Open Innovation*, 5(2). 10.3390/joitmc5020030

Isaksson, A., Harjunkoski, I. & Sand, G. (2018). The impact of digitalization on the future of control and operations. *Computers & chemical engineering*, 114(1), 122-129. 10.1016/j.compchemeng.2017.10.037

Jyrkämä, J. (1999). Toimintatutkimus. <https://www.fsd.tuni.fi/fi/palvelut/menetelmaopetus/kvali/tutkimusasetelma/toimintatutkimus/>

Kananen, J. (2014). Toimintatutkimus kehittämistutkimuksen muotona. Jyväskylä. JAMK.

Kerpedzhiev, G., König, U., Röglinger, M. & Rosemann, M. (2020). An Exploration into Future Business Process Management Capabilities in View of Digitalization. *Business & information systems engineering*, 63(2), 83-96. <https://doi.org/10.1007/s12599-020-00637-0>

Klein, V. & Todesco, J. (2021). COVID-19 crisis and SMEs responses: The role of digital transformation. *The Journal of Corporate Transformation*, 28(2), 117-133. <https://doi-org.proxy.uwasa.fi/10.1002/kpm.1660>

Klymenko, O., Lillebrygfjeld Halse, L. & Jæger, B. (2021). The Enabling Role of Digital Technologies in Sustainability Accounting: Findings from Norwegian Manufacturing Companies, *Systems*, 9(2), 33. <https://doi.org/10.3390/systems9020033>

Kostetskyi, P. (2021). Does Digitalization Lead to Better Transparency: Bibliometric Approach. *Business Ethics and Leadership*, 5(3). [https://doi.org/10.21272/bel.5\(3\).102-107.2021](https://doi.org/10.21272/bel.5(3).102-107.2021)

Legner, C., Eymann, T., Hess, T., Matt, C., Böhmman, T., Drews, P., Mädche, A., Urbach, N. & Ahlemann, F. (2017). Digitalization: Opportunity and Challenge for the Business and Information Systems Engineering Community. *Business & Information Systems Engineering*, 59(4). [10.1007/s12599-017-0484-2](https://doi.org/10.1007/s12599-017-0484-2)

Lenka, S., Parida, V. & Wincent, J. (2017). Digitalization Capabilities as Enablers of Value Co-Creation in Servitizing Firms. *Psychology & marketing*, 34(1), 92-100. [10.1002/mar.20975](https://doi.org/10.1002/mar.20975)

Li, L., Su, F., Zhang, W. & Mao, J. (2017). Digital transformation by SME entrepreneurs: A capability perspective. *Information systems journal*, 28(6), 1129-1157. <https://doi.org/10.1111/isj.12153>

Lieb, K. & Lieb, R. (2010). Environmental sustainability in the third-party logistics (3PL) industry. *International Journal of Physical Distribution & Logistics Management*, 40 (7), 524-533. [10.1108/09600031011071984](https://doi.org/10.1108/09600031011071984)

Martin, T. (2022). Digital transformation: How dynamic companies adapt to constant change. FastCompany. <https://www.fastcompany.com/90775545/digital-transformation-how-dynamic-companies-adapt-to-constant-change>

Monton, A. (2022). Difference and Similarities: Digitization, Digitalization, and Digital Transformation. GlobalSign Blog. <https://www.globalsign.com/en-sg/blog/difference-and-similarities-digitization-digitalization-and-digital-transformation>

Mynenko, S.& Lyulyov, O. (2022). The Impact of Digitalization on the Transparency of Public Authorities. Business Ethics and Leadership, 6(2). [http://doi.org/10.21272/bel.6\(2\).103-115.2022](http://doi.org/10.21272/bel.6(2).103-115.2022)

Nadkarni, S. & Prügl, R. (2020). Digital transformation: a review, synthesis and opportunities for future research. Management Review Quarterly, 71(2), 233–341. <https://doi.org/10.1007/s11301-020-00185-7>

Nambisan, S., Lyytinen, K., Majchrzak, A. & Song, M. (2017). Digital Innovation Management: Reinventing Innovation Management Research in a Digital World. MIS quarterly, 41(1), 223-238. [10.25300/MISQ/2017/41:1.03](https://doi.org/10.25300/MISQ/2017/41:1.03)

Nash, E., Jarrahi, M. & Sutherland, W. (2020). Nomadic work and location independence: The role of space in shaping the work of digital nomads. Human behavior and emerging technologies, 3(2), 271-282. [10.1002/hbe2.234](https://doi.org/10.1002/hbe2.234)

nShift. (2023). For more efficient supply chains. <https://nshift.com/solutions/transport-management-system?hsCtaTracking=a9eace81-4137-4f23-8ea4-ed9bdacf522%7C867d19fc-8763-4d66-bc53-72faa868129b>

Nunes, M. & McPherson, M. (2002). No Lectures On-Campus:

Can eLearning Provide a Better Learning Experience?. ResearchGate. <https://www.researchgate.net/publication/241014356>

Opresnik, D., & Taisch, M. (2015). The value of Big Data in servitization. *International Journal of Production Economics*, 165(1), 174–184. <https://doi.org/10.1016/j.ijpe.2014.12.036>

Parviainen, P., Tihinen, M., Kääriäinen, J. & Teppola, S. (2017). Tackling the digitalization challenge: How to benefit from digitalization in practice. *International journal of information systems and project management*, 5(1), 63-77. [10.12821/ijispm050104](https://doi.org/10.12821/ijispm050104)

Puusa, A., Juuti, P., & Aaltio, I. (2020). *Laadullisen tutkimuksen näkökulmat ja menetelmät* (2nd ed.). Gaudeamus.

Raine, V., & Aarnos, E. (2018). *Ikkunoita tutkimusmetodeihin 1 - Metodien valinta ja aineistonkeruu* (5th ed.). PS-kustannus.

Ramachandran, R. (2020). Navigating digitalization in big business. *ABB Review*. <https://new.abb.com/news/detail/69449/navigating-digitalization-in-big-business>

Reyes-Rodríguez, J. & Ulhøi, J. (2021). Justifying environmental sustainability in small-and-medium-sized enterprises: An analysis of complementary assets in the printing industry. *Business strategy and the environment*, 31(1), 59-75. <https://doi.org/10.1002/bse.2874>

Ritter, T. & Pedersen, C. (2020). Digitization capability and the digitalization of business models in business-to-business firms: Past, present, and future. *Industrial Marketing Management*, 86, 180-190. [10.1016/j.indmarman.2019.11.019](https://doi.org/10.1016/j.indmarman.2019.11.019)

Rosin, A., Proksch, D., Stubner, S. & Pinkwart, A. (2020).

Digital new ventures: Assessing the benefits of digitalization in entrepreneurship. *Journal of small business strategy*, 30(2), 59-71. <https://www-proquest-com.proxy.uwasa.fi/scholarly-journals/digital-new-ventures-assessing-benefits/docview/2465478959/se-2?accountid=14797>

Sanders, M. N. K., Lewis, P., & Thornhill, A. (2007). *Research methods for business students* (Vol. 4). Pearson Education UK

SAP. (2022). What is SAP?. <https://www.sap.com/about/company/what-is-sap.html>

Scribbr, (2018). Opinnäytetyön teoreettinen viitekehys: mitä ja miksi?

<https://www.scribbr.fi/opinnaytetyon-rakenne/opinnaytetyon-teoreettinenviitekehys-mita-ja-miksi/>

Silverman, D. (1997). *Qualitative research: Theory, Method and Practice*. Surrey: Sage Publications Ltd.

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, 104(1), 333-339. 10.1016/j.jbusres.2019.07.039

Synthia, G., Fahira, J., Himawan, D. & Keke, Y. (2020). The Implementation of Delivery Order Online as an Effort of Operational Efficiency. *Journal of Physics: Conference Series*, 1573(1). 10.1088/1742-6596/1573/1/012031

Tkalac Verčič, A., Sinčić Ćorić, D. & Pološki Vokić, N. (2021). Measuring internal communication satisfaction: validating the internal communication satisfaction questionnaire. *Corporate communications*, 26(3), 589-604. 10.1108/CCIJ-01-2021-0006

Hartikainen, A. & Lillman, A. (2016). Tullin määräys asiakirjojen arkistoinnista annettaessa ilmoitukset sähköisesti. Tulli. <https://tulli.fi/-/tullin-maarays-asiakirjojen-arkistoinnista-annettaessa-ilmoitukset-sahkoisesti>

Turner, J. (2022). 6 Ways the Workplace Will Change in the Next 10 Years. Gartner. <https://www.gartner.com/smarterwithgartner/6-ways-the-workplace-will-change-in-the-next-10-years>

Vartolomei, V. & Avasilcai, S. (2019).

Challenges of digitalization process in different industries. before and after. IOP Conference Series: Materials Science and Engineering, 568(1). 10.1088/1757-899X/568/1/012086

Verhoef, P., Broekhuizen, T., Bart, Y., Bhattacharya, A., Dong, J., Fabian, N. & Haenlein, M. (2021) Digital transformation: A multidisciplinary reflection and research agenda☆. Journal of Business Research, 122, 889-901. <https://doi.org/10.1016/j.jbusres.2019.09.022>

Vial, G. (2019). Understanding digital transformation: A review and a research agenda. Journal of Strategic Information Systems, 28, 118-144. <https://doi.org/10.1016/j.jsis.2019.01.003>

Wen, H., Zhong, Q. & Lee, C. (2022). Digitalization, competition strategy and corporate innovation: Evidence from Chinese manufacturing listed companies. International Review of Financial Analysis, 82. <https://doi.org/10.1016/j.irfa.2022.102166>