The Exploring Digital Framework

A Comparative Case Study within the Swedish Manufacturing Industry

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Abstract

Title

The Exploring Digital Framework: A Comparative Case Study within the Swedish Manufacturing Industry

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Background

As new digital technologies and concepts arise, the inherent meaning of digitalization broadens. Consequently, companies experience increasing complexity of setting digital priorities and successfully carrying through digital initiatives. The working hypothesis of this master thesis is that this problematic situation partially derives from an absence of a tool that allows for exploring, navigating, and structuring organizations' approach towards becoming more digital. As the Swedish manufacturing industry's digital agenda seems ambitious but scattered, this industry makes a suitable subject for exploring digital to develop and validate such a tool.

Purpose

The purpose of this master thesis is twofold. Firstly, this master thesis aims to develop and validate an explorative framework for digital strategy and digital transformation. Secondly, by applying the explorative framework, this master thesis aims to generate insights considering the digital agenda of the Swedish manufacturing industry.

Research questions

The development and validation of the explorative framework itself does not correspond to an explicit research question (RQ) but is rather viewed as an overriding objective. There are however five explicit research questions regarding the Swedish manufacturing industry's digital agenda:

RQ1: What is the current digital state of business?
RQ2: What is the digital vision, and what digital priorities correspond to this vision?
RQ3: What digital initiatives are currently being pursued?
RQ4: What are the digital drivers, and who drives the digital agenda?
RQ5: What are the digital challenges?

Method

To support the twofold purpose, this master thesis has an abductive approach. The development and validation of the explorative framework require a deductive orientation, while the insights generated by applying it correspond to inductive reasoning.

Delimitations

The explorative framework is validated based on a comparative analysis of two large cap Swedish manufacturing companies selected through a convenience sample.

Findings

The Exploring Digital Framework is an adequate tool for exploring, navigating, and structuring digital strategy and digital transformation.

RQ1: The digital state is lacking. The value proposition consists of physical products, and no substantial digital service offerings are in place. Infrastructure and processes are sophisticated but not necessarily digital. Customer engagement is mostly conventional. There is a feeling of being in digital debt. Digital assessments and benchmarking leads to greater self-awareness of the true digital state.

RQ2: The digital vision is harmonized and revolves around connectivity, traceability, servitizing the business model, smart manufacturing, strengthened operational backbones and clarified ownership.

RQ3: Digital initiatives are aligned with the digital vision but ranges over various stages of digital development due to discrepant digital states. A digital strategy is guiding in terms of focus and prioritization, and seems to facilitate clarification of ownership, governance, and organizational structuring.

RQ4: When ownership is clarified, a chief digital officer (CDO) is the go-to approach for driving the digital agenda. When ownership is not clarified, allocation of responsibility is scattered and decentralized to business unit level.

The top five digital drivers, in no particular order, are: (1) New business opportunities and increase revenue, (2) Leaner and more efficient operations, (3) Further strengthen core values, (4) Getting a competitive edge, and (5) Expectations of customers.

RQ5: The top three digital challenges, in no particular order, for digital strategy are: (1) Building an adequate digital strategy and enable executional excellence, (2) Avoiding or getting out of digital debt, and (3) Grasping and meeting customer expectations.

The top three digital challenges, in no particular order, for digital transformation are: (1) Getting the organization onboard, (2) Realizing and proving benefits and business cases, and (3) Backing up technological advancement with business model reinvention.

Theoretical and practical implications and contributions

This master thesis clarifies and extends the vocabulary in the digital sphere of academia. Academia could utilize the Exploring Digital Framework to further explore the digital phenomena. This framework could also be used for educational purposes, for example to solve cases or facilitate discussions within university courses concerning, or in close perimeter to, digital strategy and digital transformation.

The Exploring Digital Framework is a digital roadmap. Practitioners could use this framework to structure their thoughts and to explore scenarios for digital strategies, and to bring awareness of the organization's approach towards digital transformation. The Exploring Digital Framework facilitates focusing of digital efforts and digital prioritization, and could assist practitioners when conducting digital assessments or building digital strategies. Concludingly, the Exploring Digital Framework is a tool for the emerging role of the CDO, used to explore, navigate, and structure digital.

Keywords

Exploring Digital Framework, Digitalization, Digital Agenda, Digital Disruption, Digital Strategy, Digital Business Strategy, Digital Transformation, Digital Drivers, Digital Challenges, Digital Debt, Digital Surplus, Digital Roadmap, Swedish Manufacturing Industry, Servitization, Techquilibrium

Table of Contents

List of Figures

List of Tables

Vocabulary

This vocabulary is sorted by the order of occurrence, from first to last.

Swedish manufacturing industry	Refers to firms with Swedish origin and with manufacturing as their primary value adding activity. The definition of Swedish manufacturing companies in this master thesis does however not disallow the included case companies to have a global business presence.
Digitalization	A dynamic and ever-growing term that describes the trend in which companies introduce more and more digital technologies and concepts to reshape customer value and enhance the organization's capabilities to create and deliver this value.
Digital disruption	The rapidly unfolding processes through which digital innovation comes to fundamentally alter historically sustainable logics for value creation and capture by unbundling and recombining linkages among resources or generating new ones.
Digital (business) strategy	A guiding direction and plan of actions to withstand digital turbulence in the business environment and to obtain a desirable competitive position through reshaping, creating and delivering customer value by leveraging digital technologies and concepts.
Digital vision	An idea or target of how a company's business could be digitally enhanced in the future.
Servitization	The trend in which manufacturing firms adopt more and more service components in their offerings. Originally defined as market packages or 'bundles' of customer-focused combinations of goods, services, support, self-service and knowledge.
Digital transformation	Carrying through digital initiatives to accompany digitalization with the goal of building towards the digital priorities set by the digital strategy.
Digital drivers	Both external and internal aspects that affect the pace and direction of digital transformation for a company or industry.

Digital challenges	Resistances, trade-offs and dilemmas that organizations face when building a digital strategy and engaging in digital transformation.
Techquilibrium	The balance point where the enterprise has the right mix of traditional and digital capabilities and assets, to power the business model needed to compete most effectively, in an industry that is being digitally revolutionized.
Digital ecosystem	A network of several organizations that aims to collaboratively reshape, create and deliver customer value by leveraging digital technologies and concepts, and by combining their digital resources, digital expertise and digital business opportunities.
Digital debt	Digital advancements have been lacking in the recent past, resulting in that much must be done at the same time in the present or near future to mitigate the risk of digital disruption.
Digital surplus	Digital advancements have been excessive in the recent past, resulting in an excess of digital capabilities and assets that could either give a competitive edge or, if unexploited, lead to inefficiencies.

Chapter 1

Introduction

The introduction of this master thesis highlights the new era of digitalization that all industries seem to be facing. In this chapter, some of the fundamental concepts of this master thesis are briefly introduced, followed by a more precise discussion of the problem situation and the master thesis' purpose. Research questions are thereafter established, and the delimitations as well as the target audience and outline of the master thesis are presented.

1.1 Background

The word digitalization has been buzzing for decades and never seems to step outside the spotlight of attention. However, what was digitalization a few decades ago is not necessarily what we refer to as digitalization today (Ritter & Pedersen, 2020). Speaking of digitalization in the 1970s could refer to the introduction and market adoption of personal computers (Computer History, n.d. a), which were set to revolutionize the way companies conducted work and did business. Today we do not find computers as revolutionary in terms of digital innovation. When we speak of digitalization today, we are probably referring to digital technologies and concepts such as machine learning (Chui et al, 2018), artificial intelligence (AI) (Bughin et al, 2018a), blockchain technologies (Carson et al, 2018), cloud computing and big data (Bharadwaj et al, 2013), automation of processes (Manyika et al, 2017) and e-commerce (Yeow et al, 2018). As new digital technologies and concepts arise, the inherent meaning of digitalization broadens. What digitalization *is* seems to be dynamic and ever-growing.

Digitalization has revolutionized the way society works, how we live our lives, how we consume and how companies do business (Parviainen, 2017), and will continue to do so. Let us continue the example of the revolutionary electronic thinking machine – the personal computer. In 1971 Intel introduced the first microprocessors (Computer History, n.d. b), which allowed for more slim and efficient computers. In 1972, the C programming language was released (Computer History, n.d. c). These were both important steppingstones towards facilitating programming for industrial applications, and both the personal computer and the C programming language are widely used today. Looking back at the evolution and adoption of the personal computer and the C programming language, it seems utterly obvious that they were to become smash hits. Could we foresee this evolvement back in the 1960s and 1970s? In 1963

Lee (1970) conducted a survey on the attitudes about the "electronic thinking machine" in North America with a sample of 3000 persons aged 18 or older, and the supported statements were:

- They can think like a human being thinks.
- With these machines, the individual personal will not count for very much anymore.
- They sort of make you feel that machines can be smarter than people.
- Someday in the future, these machines may be running our lives.
- There is no limit to what these machines can do.
- The machines can make important decisions better than people can.
- Electronic brain machines are kind of strange and frightening.
- They are so amazing that they stagger your imagination.
- These machines help to create unemployment.

Some of these statements contain parts of the truth, but certainly not all of it. The American computer scientist Dianne Martin (1993) concludes, after reviewing Lee's survey together with several similar subsequent surveys of several other authors (e.g. Morrison, 1983), that no one anticipated the impact that computers had on our society and business environment. Hinted by the supported statements in Lee's (1970) survey, the gap between the complexity of the computer relative to the common knowledge at the time induced fear, a pinch of skepticism and confusion.

Let us now look at one of the hot topics of digitalization today: AI. In 2015 we saw Google DeepMind's AlphaGo defeat the 9 dan Go player and former champion Lee Sedol (Vincent, 2019). The same year we also witnessed some of the world's brightest minds and eminent tech gurus, Bill Gates, Elon Musk and Stephen Hawking, express their fear of AI (Computer History, n.d. d). Could this be the "electronic thinking machine"-situation all over again, in which no one can anticipate the impact digital technologies such as AI could have on our society and business environment?

From a business standpoint, being afraid, skeptical, confused and digitally paralyzed is not an option. Companies cannot just ignore digitalization. In 2000 the founder of Netflix, Reed Hastings, proposed a partnership to Blockbuster's CEO John Antioco (Satell, 2014). The idea behind the partnership was that Netflix would run Blockbuster's brand online and Blockbuster would promote Netflix in their physical stores. Antioco laughed at this partnership offer (Sandoval, 2010). In just a decade, Netflix had surpassed Blockbuster in terms of revenue, and in 2010 Blockbuster filed for bankruptcy (Tyler, 2017).

Looking at other industries we can see similar scenarios with Uber in the taxi business and Amazon in the retail business. All industries seem to be facing inevitable digital transformation (Hess et al, 2016), and so does the manufacturing industry. For example, the manufacturing industry is undergoing digital transformation and intelligentization of the manufacturing processes (Schumacher et al, 2016). The digital transformation of the manufacturing processes primarily refers to the adoption of industry 4.0 related digital technologies such as internet of things (IoT), cloud computing, augmented reality and big data (Gerbet et al, 2015). Prosperous use of such digital technologies is enabled by infrastructural platform technology and an operational backbone (Alcácer & Cruz-Machado, 2019; Sebastian et al, 2017), which in turn could require a digital ecosystem to successfully be established (Weiss, 2018). Automation of

non-manufacturing processes are also apparent (Manyika et al, 2018), and so is digital transformation of the supply chain (Büyüközkan & Göçer, 2018). On a more strategic level, we can also witness digital transformation of entire business models (Berman, 2012), and servitization (Lerch & Gotsch, 2015). Such major digital development could affect companies primary value proposition (Sebastian et al, 2012), how this value is created (Berman, 2012), and how companies engage with their customers (Sebastian et al, 2017; Yeow et al, 2018). The manufacturing industry is exposed to numerous digital technologies and concepts of various character and thereby faces a digital crossroad that induces directional uncertainty. That is, what digital priorities to make and what digital initiatives to pursuit (Furr & Shipilov, 2019).

The explosion of digital technologies and concepts make it even more difficult to navigate your business environment and secure your company's long-term prosperity. Not only are we witnessing an explosion of digital technologies and concepts, but we are also witnessing a paradigm shift in terms of the characteristics of digitalization (Dumeresque, 2014). During the past 50 years, hardware development has been leading in terms of substantial business benefits. In this new digital era, the software revolution is now surging. Dumeresque (2014) also highlights how this paradigm shift is reflected in the way companies structure themselves in terms of their organizational approach towards digital transformation. Previously, the IT department, reporting to a chief information officer (CIO) or even a chief financial officer (CFO), has driven the digital agenda. With increasing pressures of this new era of digital transformations, we can now witness the uprising of the chief digital officer (CDO). Such digital initiatives are noticeable in the Swedish manufacturing industry, in which for example AB Volvo introduced its first CDO, Scott Rafkin, in December of 2019 (AB Volvo, 2019). Martin Lundstedt, the chief executive officer (CEO) of AB Volvo, comments that this digital initiative aims to help AB Volvo drive its digital transformation agenda, where this agenda refers to key areas such digital technologies, internal capabilities and new business models (AB Volvo, 2019). Simultaneously, in November in 2019, Johan Tömmervik, the CIO of SKF who was responsible for driving the digital agenda for SKF left the company (Lundgren, 2019). SKF has not yet announced a new CIO or CDO, and instead calms the shareholders by implying that its CFO has a strong background in IT (Lundgren, 2019). Just before that, Husqvarna launched a new division to manage its "broad and rapid digital transformation" (Husqvarna, 2018). At first sight, the digital agenda of the Swedish manufacturing industry seems ambitious but scattered. Much seems to be happening, but it remains unclear *what* is happening.

No industry seems to escape digitalization, and certainly not the Swedish manufacturing industry, which means that aiming for avoidance is not a valid approach. The right digital initiatives must be pursued, and the right digital priorities must be set. That is, companies need an adequate digital strategy and a distinctive approach towards digital transformation.

1.2 Problem Discussion

Digital technologies and concepts have increased in numbers and become even more complex. This requires a more selective approach towards what digital technologies and concept to engage in. As the number of available digital technologies and concepts increase, so does the complexity of building a successful digital strategy and setting priorities for digital transformation. In today's digital era, Andal-Ancion et al's (2003) statement about successful digital transformation: "the key to success is knowing how and when to apply the technologies", holds true now more than ever. The very question of *how* and *when*, and even the question of *what*, *why* and *who*, is however ambiguous. That is, *what* digital initiatives should we pursuit

and *what* digital priorities should we make, *how* and *why* do we approach these, *who* is driving and *when*.

Bonnet et al (2012) highlight that only a minority of companies genuinely reshape their business through digital transformation, and ever fewer do it while realizing significant benefits. Companies cannot just ignore the emerging digital technologies and concepts since these could have the potential power to reshape the entire industrial landscape (Lerch & Gotsch, 2015). By not keeping up with the development of the digital business environment, companies could soon find themselves on the verge of extinction (Lerch & Gotsch, 2015). The realization of this new digital business environment seems to force companies into both escalating and focusing their digital efforts, with the uprising of CDOs deriving from this phenomenon (Dumeresque, 2014).

The complexity of the new digital business environment lies in the uncertainty of what digital priorities yield the most benefits in the near-, mid- and long-term and simultaneously align with the digital strategy and overall business plan. The essence of the problem is that it seems rather difficult to foresee which digital technologies and concepts that could give positive business impact. It is both difficult and necessary to know what digital technologies and concepts to pursuit and how to apply them to enhance the business (Furr & Shipilov, 2019) – this creates a delicate contradiction. The Swedish manufacturing industry, in which the digital agenda seems both ambitious and scattered, will be studied to explore this problematic and contradictive situation. Moreover, there seems to be a lack of mental frameworks and tools to explore, navigate and structure companies' journeys of becoming more digital. This master thesis is set out to develop and validate such a tool while simultaneously generating insights regarding digital strategy and digital transformation within the Swedish manufacturing industry.

1.3 Purpose

The purpose of this master thesis is twofold. Firstly, this master thesis aims to develop and validate an explorative framework for digital strategy and digital transformation. Secondly, by applying the explorative framework, this master thesis aims to generate insights considering the digital agenda[1] of the Swedish manufacturing industry.

1.4 Research Questions

In line with the purpose, the focus of this master thesis is twofold. The development and validation of the explorative framework itself will not correspond to an explicit research question (RQ) but is rather viewed as an overriding objective. Thus, the accumulations regarding the explorative framework will be included in the conclusion. The application of the explorative framework is set to generate insights of the Swedish manufacturing industry's digital agenda by answer the following five RQs:

RQ1: What is the current digital state of business?

RQ2: What is the digital vision, and what digital priorities correspond to this vision?

RQ3: What digital initiatives are currently being pursued?

[1] The digital agenda refers to the outlook of digital strategy, how digital transformation is approached, what and who drives digital development as well as the challenges that companies face in the context of becoming more digital.

RQ4: What are the digital drivers, and who drives the digital agenda?

RQ5: What are the digital challenges?

1.5 Delimitations

The case study in this master thesis revolves around a sample consisting of two large cap Swedish manufacturing companies within different sub-industries. These two companies have been selected through a convenience sample. The initial scope was to include a larger sample consisting of four companies, but the Coronavirus outbreak led to a reduction in sample size.

1.6 Target Audience

This master thesis is written at the Division of Production Management within the Department of Industrial Management and Logistics at the Faculty of Engineering (LTH), Lund University, which implies that its divisional members and students could find interest in this master thesis. Simultaneously, this study aims to be beneficial for the participating case companies. This master thesis also targets management and industry professionals who are exploring digital. Lastly, this master thesis could also be useful for academia in close perimeter to this topic.

1.7 Master Thesis Outline

This master thesis has six chapters in total, and the structure is as follows:

Chapter 1: Introduction
The first chapter sets the scene for this master thesis. Relevant background for the subject area is given, which is then followed by a more focused problem discussion. The master thesis' purpose, research questions, delimitations and target audience are also presented.

Chapter 2: Method
In the second chapter, the research strategy, approach and design are presented. This chapter aims to provide the reader with full transparency of the overall working process of this master thesis.

Chapter 3: Theoretical Framework
The third chapter begins with a literature review that covers digitalization, digital disruption, the fundamentals of digital strategy and digital transformation, digital drivers and digital challenges. The literature review aims to act as a foundation for an explorative framework that later will be used to conduct a case study. The construction of this explorative framework concludes the third chapter.

Chapter 4: Case study
The fourth chapter presents the empirics from the case study. These empirics are gathered through interviews and are structured based on the explorative framework that was constructed in Chapter 3.

Chapter 5: Analysis
In the fifth chapter, the empirics are analyzed in a comparative fashion by using the theoretical framework and the research questions as a reference point. This analysis aims to give valuable insights of the digital agenda of the Swedish manufacturing industry.

Chapter 6: Conclusion

The sixth chapter is the concluding chapter of this master thesis. In this chapter, the insights accumulated throughout the master thesis are presented alongside their theoretical and practical implications and contributions. To conclude this chapter and the master thesis, suggestions for further research are given.

Chapter 2

Method

This chapter aims to transparently present the research strategy, approach and process design. Detailed descriptions of the overall working process, trade-offs and best practice research ethics are also given.

2.1 Research Strategy

This research is conducted in two interacting parts. The first part refers to the development and validation of an explorative framework that derives from an extensive literature review. The second part refers to the application of the explorative framework. The application of this explorative framework consists of a case study that aims to both validate the framework itself, and simultaneously generate insights of digital strategy and digital transformation. The validation is qualitative and based on the framework's applicability in the context of this master thesis. That is, whether it supports structuring of the case study or not, and if it allows for capturing all aspects of digital that are presented by the case companies' representatives.

The purpose of this research is of explorative character. That is, to explore and assess a phenomenon to generate a deeper understanding of it (Höst et al, 2006). In the context of this master thesis, digital strategy and digital transformation are the phenomena that are being explored. The focus is primarily future oriented with the present set as a point of reference.

2.2 Research Approach

This research has an approach with both deductive and inductive elements, which in its entirety could be referred to as abductive (Saunders et al, 2015). The applied abductive research approach is illustrated in Figure 1.

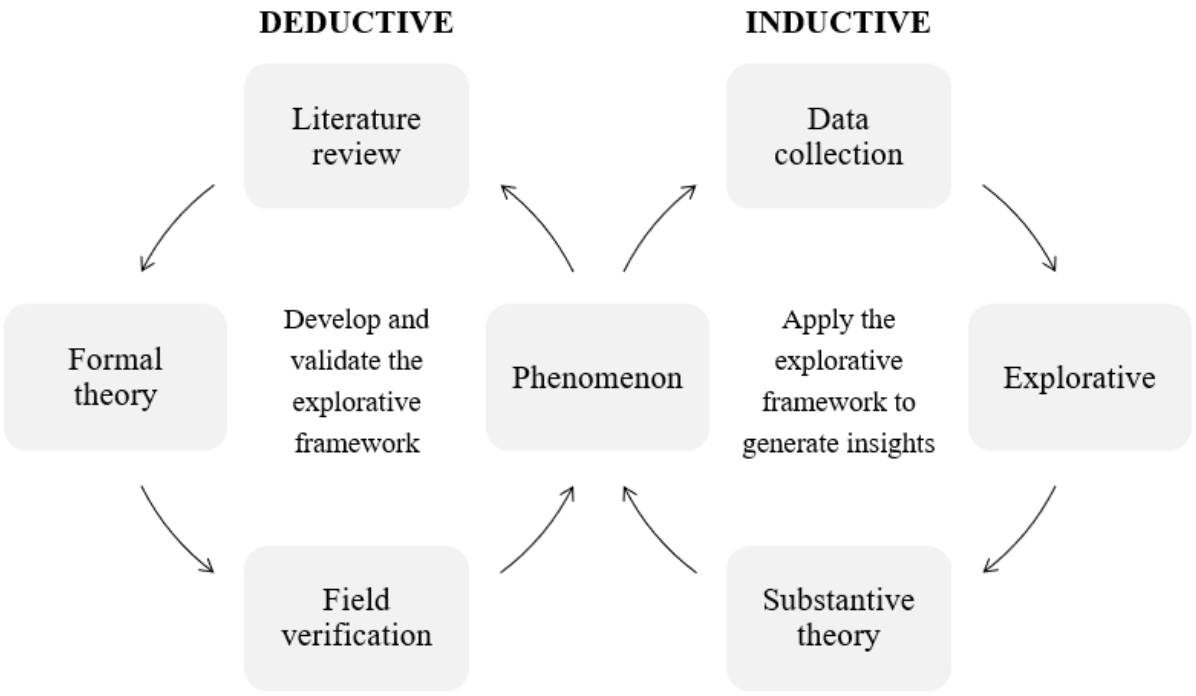

Figure 1:
An abductive research approach, inspired by Woodruff (2003)

Firstly, developing and validating the explorative framework implies a deductive orientation. The developed framework could be seen as a premise that through deductive reasoning is either verified or not (Saunders et al, 2015). However, the validation procedure will only rely on a qualitative case study and can thereby only be qualitatively confirmed. A more quantitative approach of validation could perhaps be a suggestion for further research.

Secondly, the application of this explorative framework calls for an inductive approach. This inductive approach consists of gathering data through a qualitative case study and uses comparative analysis to generate insights. Simultaneously, the application will provide the sole basis for validating the explorative framework. The purpose of the case study is therefore twofold: (1) field verification of the explorative framework, and (2) exploring the digital phenomenon to generate insights in the shape of a substantive theory. A case study is suitable for both instances (Denscombe, 2018; Yin, 2014).

2.3 Research Process Design

The research process design of this master thesis consists of three phases: (1) Define & develop, (2) Apply & analyze, and (3) Validate & conclude. A more detailed illustration of these phases is found in Figure 2.

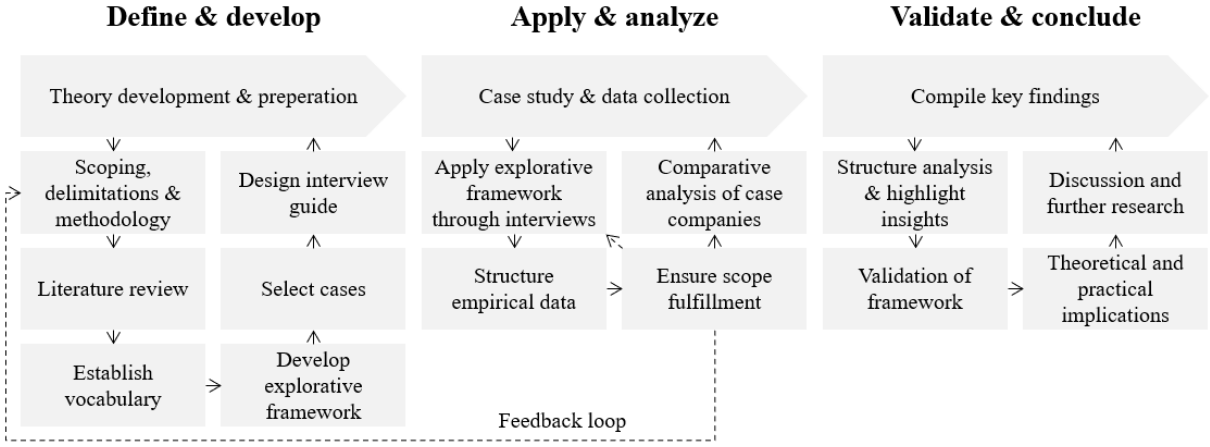

Figure 2:
The research process design, inspired by research approaches suggested by Höst et al (2006) and Yin (2014)

During the first phase, the theoretical foundation is developed and preparation for the upcoming case study is conducted. After the scope, delimitations and methodology are set, an extensive literature review is conducted. This literature review fulfills two purposes. Firstly, it generates a theoretical foundation by establishing the vocabulary needed for this master thesis. Secondly, it provides the basis for the development of an explorative framework. This explorative framework will be the main tool for exploring, navigating, and structuring the addressed problem situation of this master thesis. Both academia's and practitioners' viewpoints are represented in the literature review, with the goal of providing a legitimate and comprehensive theoretical foundation concerning relevant areas. To ensure the reliability and validity of this literature review, a list of the main search keywords is provided in Appendix A.

The theoretical foundation thereafter leads into identification of relevant case companies as well as the design of a suitable interview guide. The case companies are selected partially based on convenience, but also based on their subjective relevance. The same logic applies to the chosen representatives within each case company. As this master thesis has a strategic focus, all representatives will be on top or upper management level. The case companies are viewed as single entities, and no distinction will be made regarding which representative the empirics originates from within the same case company. The underlying reason for this delimitation is that the case study aims to be comparative between companies, and not within companies. All case companies are large cap traditional manufacturing companies within the Swedish manufacturing industry. The focus on large and traditional manufacturing companies derives from that such companies are less agile in general, which makes challenges of digitalization more apparent. In the context of this master thesis, the Swedish manufacturing industry refers to firms with Swedish origin and with manufacturing as their primary value adding activity. The definition of Swedish manufacturing companies in this master thesis does however not disallow the included case companies to have a global business presence.

The second part of this research consists of a comparative case study based on qualitative data collected through semi-structured deep interviews. A semi-structure deep interview is a method in which there is a clear list of questions, and the majority of these questions are open in the

sense that the interviewee is allowed to elaborate (Denscombe, 2018). The interview guide that will be used in all interviews originates from the Exploring Digital Framework on page 26, and can be found in Appendix B. Interviews with several different persons within each case company could be conducted to ensure the fulfillment of the scope. This approach derives from the fact that relevant areas of expertise could be distributed among several persons. Conducting multiple interviews at every case company will also result in a more reliable empirical foundation and mitigate personal bias (Lekvall & Wahlbin, 2001; Höst et al, 2006). Lekvall & Wahlbin (2001) do however highlight that qualitative research based on semi-structured deep interviews generally have lower reliability than an equivalent quantitative approach. All interviews will be held one-to-one. Structuring the collected empirical data is done with the help of the explorative framework. A comparative analysis between the case companies is conducted when the collected empirical data fulfills the scope.

Digital strategy could be considered as sensitive information, and it is thereby of great importance to follow best practice research ethics. Denscombe (2018) highlights four principles regarding best practice research ethics: (1) protect the participants' interests, (2) ensure voluntary participation based on an informed decision of consent, (3) avoid false representation of the empirics by prioritizing scientific integrity, and (4) follow national laws and regulations. In the context of this master thesis, it is of utmost importance that no sensitive information is disclosed. All case companies will therefore be treated confidentially. The participating case companies and their representatives will not be disclosed, neither direct nor indirect. By doing so, the participants' interests remain protected. Furthermore, all participants will be participating voluntarily and will be informed on the context of this study before doing so.

During the third phase, all key findings are compiled. Insights deriving from the application of the explorative framework in a qualitative case study are structured and highlighted. The explorative framework will be validated based on these qualitative proceedings. Irrespectively, insights regarding the digital agenda of the Swedish manufacturing industry will be generated and highlighted. The theoretical and practical implications and contributions of the explorative framework itself, and the insights that it generates, will be underlined. A discussion of the accumulations of this study and suggestions for further research concludes the master thesis.

2.4 Extraordinary Research Limitations

The Coronavirus outbreak resulted in urgent crisis management for all companies during the entirety of March and April 2020. The responsibility of such crisis management primarily falls upon top and upper management, implying a necessary reprioritization of time allocation. This extraordinary situation implied that interviews for a master thesis had trouble to fit into top and upper management's agenda. Ultimately, this led to a reduction in sample size. Two of the four companies with initial intentions to participate had to reprioritize, resulting in this master thesis being omitted.

The process of building the empirical foundation with the two remaining participating companies was also affected. Due to various restrictions regarding travelling and face-to-face meetings from the Ministry for Foreign Affairs (Utrikesdepartementet) and the Public Health Agency (Folkhälsomyndigheten), all interviews were conducted over Skype or Microsoft Teams. As much as the Coronavirus outbreak increased the methodical complexity of this master thesis, it did not have a significant effect on the quality of its outcome. The reduction in sample size represents a minor redirection of scope, resulting in a shift from four relatively short cases towards two more extensive cases.

Chapter 3

Theoretical Framework

This chapter begins with a literature review of key areas and concepts for this master thesis. The literature review covers digitalization and digital disruption, the fundamentals of digital strategy and digital transformation, and the appurtenant digital drivers and challenges. This literature review thereafter leads into an explorative framework that later will be used as the main tool to answer the research questions. Altogether the literature review and the explorative framework creates the theoretical foundation for this master thesis.

3.1 Literature review

3.1.1 Digitalization and Digital Disruption

Digitalization is considered a top trend that is changing business (Parviainen et al, 2017), but it does not seem to have an unequivocal and established definition in academia. Also, digitalization is sometimes interchangeably referred to as digitization (Ritter & Pedersen, 2020). Ritter & Pedersen (2020) compiled selected definitions of digitization, digitalization and digital from various authors, see Table 1.

Table 1:
Selected definitions of digitization, digitalization and digital, based on Ritter & Pedersen (2020)

Authors	Construct	Definition
Coreynen et al (2017) based on Hsu (2007)	Digitization	"the increasing use of digital technologies for connecting people, systems, companies, products and services"
Brennen and Kreiss (2016) based on Oxford English Dictionary	Digitization	"the action or process of digitizing; the conversion of analogue data (esp. in later use images, video, and text) into digital form"
Brennen and Kreiss (2016)	Digitization	"the material process of converting analog streams of information into digital bits"

Ross (2017)	Digitization	"digitization involves standardizing business processes and is associated with cost cutting and operational excellence"
Brennen and Kreiss (2016) based on Oxford English Dictionary	Digitalization	"the adoption or increase in use of digital or computer technology by an organization, industry, country, etc."
Brennen and Kreiss (2016)	Digitalization	"the way many domains of social life are restructured around digital communication and media"
Ross (2017)	Digital	"To become digital, leaders must articulate a visionary digital value proposition. This value proposition must reassess how digital technologies can enhance an organization's existing assets and capabilities to create new customer value."

Seen from the practitioners point of view, the Gartner glossary defines digitalization as "the use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business" (Gartner, n.d. a). Altogether these definitions converge into describing digitalization as

> *a dynamic and ever-growing term that describes the trend in which companies introduce more and more digital technologies and concepts to reshape customer value and enhance the organization's capabilities to create and deliver this value.*

This is also the chosen definition of digitalization for this master thesis. Per this definition, digitalization has three dimensions from a business standpoint; (1) reshaping the value proposition, (2) transforming value creation, and (3) enhancing the value deliverance by leveraging digital technologies and concepts. The entirety of these dimensions also represents how digitalization can change the business model and generate revenue, as implied by Gartner (n.d. a).

With a clearer picture of what digitalization is according to both academia and practitioners, the natural progression is to review the character of its occurrence. In recent academic literature there has been distinctions of how businesses perceive digitalization, and how digitalization actually occurs (e.g. Furr & Shipilov, 2019). According to Furr & Shipilov (2019), digitalization often strikes industries incrementally rather than the commonly perceived disruptive progression. From this viewpoint, digitalization of the business environment is not disruptive per se. Instead, companies that do nothing will either be disrupted or outcompeted by companies that accompany digitalization successfully (Furr & Shipilov, 2019). Companies that do nothing, or miss out on making the right digital priorities, will soon find themselves in a position of digital disruption. An original visualization of this reasoning is found in Figure 3.

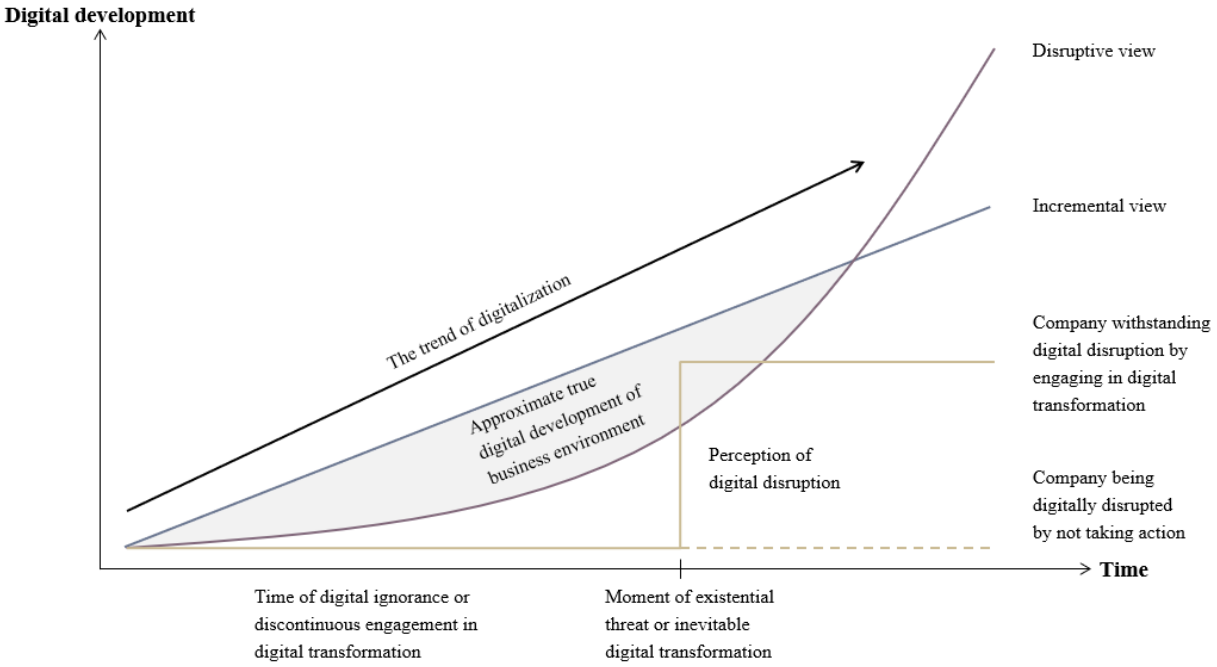

Figure 3:
A visualization of the perception of digital disruption

Weill & Woerner (2015) discuss that "the business world is rapidly digitizing, breaking down industry barriers and creating new opportunities while destroying long-successful business models", and refers to this process as digital disruption. Other authors refer to digital disruption as "a type of environmental turbulence induced by digital innovation that leads to the erosion of boundaries and approaches that previously served as foundations for organizing the production and capture of value" (Skog et al, 2018). That is, digital disruption of the business environment rather than the company itself. This implies that companies could be subjects of digital disruption inevitably. From this viewpoint, digital is not commonly incremental, but disruptive. After reviewing previous articulations of digital disruption, Skog et al (2018) propose the following definition of digital disruption:

> *The rapidly unfolding processes through which digital innovation comes to fundamentally alter historically sustainable logics for value creation and capture by unbundling and recombining linkages among resources or generating new ones.*

This definition somewhat accounts for both viewpoints, implying that digital development could be rapid, but not necessarily that companies are unable to make the right digital priorities to accompany this rapid development. To conclude, academia seems to agree upon that digitalization occurs rapidly, but authors are not unanimous in their views on whether its rapid occurrence is incremental or disruptive. This ambiguity could perhaps be explained by that being disrupted by digitalization is not solely caused by digitalization of the business environment, but rather from companies failing to accompany the digitalization trend – much like what is illustrated in Figure 3. Skog et al (2018) strengthen this argument, by implying that "digital disruption is generally perceived from the perspective of firms that are heavily invested in old conditions and whose typical or planned course of development is interrupted". The more rapid the development, the more difficult it is to identify and make the right digital priorities and to accurately develop a suitable long-term digital business direction. That is, more difficult to develop a successful digital strategy and establishing an adequate way of approaching digital transformation.

3.1.2 Digital Strategy

In a business context, strategy traditionally refers to a long-term direction and plan of actions with the goal of obtaining a competitive position and to ensure business prosperity (e.g. Porter, 1998). Strategy, in all forms, ranges over the spectrum of deliberate to emergent (Mintzberg & Waters, 1985). Mintzberg & Waters (1985) describe a purely deliberate strategy as precisely intentional, in which the intentions derive from formal plans. It is formulated by central leadership and its implementation is thoroughly measured and controlled. Purely deliberate strategies primarily exist in business environments that are predictable or controllable, as this is a prerequisite for establishing precise intentions and long-term formal plans. A perfectly emergent strategy derives from the business environment. It emerges gradually and requires consistency in action over time without the intention about it (Mintzberg & Waters, 1985). However, an absent strategy cannot be an emergent strategy as an absent strategy would not imply consistency (Mitzberg & Waster, 1985). Long-term consistency in actions cannot exist alongside a complete absent of intention. Purely deliberate or perfectly emergent strategies are rarely found in practice, as both deliberate and emergent tendencies usually coexist. Mintzberg & Waters (1985) give an excellent clarification of the coexisting tendencies of deliberate and emergent strategy: "leadership intentions could be more or less precise, concrete and explicit, and more or less shared, as would intentions existing elsewhere in the organization; central control over organizational actions would be more or less firm and more or less pervasive; and the environment would be more or less benign, more or less controllable and more or less predictable".

During the last few decades, we have witnessed an explosion of digital technologies and concepts, and a paradigm shift in the characteristics of digitalization (Dumeresque, 2014). As of now, digital technologies and concepts are applied to all parts of a company's value chain, and it is evident that these technologies and concepts no longer are a sole concern of the IT department. Digital technologies and concepts affect the entirety of the company and its business, and thereby also its strategy (Furr & Shipilov 2019; Bharadwaj, 2013; McDonald, 2012). These digital technologies and concepts come with both opportunities and existential threats, where the latter are especially apparent for big and old companies (Sebastian et al, 2017; Skog et al, 2018). Regarding the opportunities, authors mainly seem to refer to these as the application of digital technologies and concepts to meet the turbulent digital development of the business environment (Pavlou & El Sawy, 2006; 2010), enhance competitiveness (Grover & Kohli, 2013), and to create customer value that generates additional revenue (McDonald, 2012).

Authors seem to agree upon that during the last few decades, the previously more functional view on IT strategy has become insufficient in an overall business context (Bharadwaj et al, 2013; Matt, 2015). This development has forged what is now referred to as a digital business strategy – a fusion between business strategy and IT strategy (Bharadwaj et al, 2013). While the digital strategy could be a part of both the business strategy and the IT strategy, it is however critical to not confuse these terms. Having an IT strategy that treat digital technologies and concepts in isolation does not count as a digital strategy (McDonald, 2012), and having a business strategy that does not leverage digital technologies and concepts clearly lacks digital presence. Thereof the parable of digital strategy being a fusion between business strategy and IT strategy. This distinction is also beheld by practitioners (e.g. Aron, 2013), and fully aligns with academia's viewpoint. Aron (2013) highlights IT strategy as a technical answer to a business question, whereas the digital strategy should answer "how should our business evolve to survive and thrive in an increasingly digital world?". Aron (2013) further pinpoints that

digital considerations should be incorporated in all aspects of the business strategy. This requires coordination and alignment of all these interacting strategies (McDonald, 2012).

Academia provides several definitions of digital business strategy, many of them with the same or similar emphasis. For example, Bharadwaj et al (2013) define digital business strategy as an "organizational strategy formulated and executed by leveraging digital resources to create differential value". Sebastian et al (2017) define digital strategy as "a business strategy, inspired by the capabilities of powerful, readily accessible technologies, intent on delivering unique, integrated business capabilities in ways that are responsive to constantly changing market conditions". From this perspective, a digital strategy primarily refers to a business strategy that incorporates digital technologies and concepts to reshape, create and deliver value, as well as to respond to changes in the business environment. This way of defining digital strategy aligns with the characteristics of digitalization, which were reviewed in 3.1.1. By remembering academia's view on digital disruption, also discussed in 3.1.1, it is clear that a proper digital strategy could be viewed as a tool to navigate a rapidly changing digital business environment. That is, guiding business leaders to pursuit the right digital initiatives and to make the right digital priorities (Sebastian et al, 2017). By combining the definitions, this master thesis defines digital strategy as:

> *a guiding direction and plan of actions to withstand digital turbulence in the business environment and to obtain a desirable competitive position through reshaping, creating and delivering customer value by leveraging digital technologies and concepts.*

That is, a tool to handle digitalization, tackle digital disruption, and navigate digital transformation. The digital strategy is about setting future digital priorities. It is also about creating a digital vision of the company's future value proposition, and how this value is created and delivered to the customer. In this master thesis, the digital vision refers to

> *an idea or target of how a company's business could be digitally enhanced in the future.*

The digital vision is not static. A digital vision is continuously advancing as the inherent meaning of digitalization broadens due to the introduction of new digital technologies and concepts.

Sebastian et al (2017) highlight two sides of the digital strategy: (1) the digitized solution strategy and (2) the customer engagement strategy. Firstly, the digitized solution strategy refers to digitally reshaping the company's value proposition by integrating products, services and data, a phenomenon better known as servitization. Servitization refers to the "trend in which manufacturing firms adopt more and more service components in their offerings" (Desmet et al, 2003). The term *servitization* was coined by Vandermerwe & Rada (1988), who originally defined it as:

> *market packages or 'bundles' of customer-focused combinations of goods, services, support, self-service and knowledge.*

Secondly, the customer engagement strategy refers to how the company interacts with customers in a seamless and omnichannel approach. Berman (2012) formulated two digital strategy paths, much like the two sides of digital strategy proposed by Sebastian et al (2017). Berman's (2012) two paths consist of the customer value proposition and the operating model. The customer value proposition path refers to digitalizing products, services, information and customer engagement. The operation model path refers to the all infrastructure and processes

that are required to create the company's value proposition. That is, Berman's (2012) first path includes both of Sebastian et al's (2017) two sides of digital strategy. In addition to this, Berman (2012) introduces the dimension of infrastructure and processes. This infrastructure and process dimension is also supported by Hess et al (2016), but under the name of "structural changes". This dimension refers to the changes in organizational structures, processes and skill sets that are necessary to cope with and exploit new digital technologies and concepts (Hess et al, 2016). In addition to the structural dimension, Hess et al (2016) also highlight a dimension of "changes in value creation", which reflects the influence of digital transformation on a firm's value creation – much like what Sebastian et al (2017) and Berman (2012) discussed. Hess et al (2016) also provide two other dimensions of less strategic character: "the use of technologies" and "the financial aspects". These two dimensions could rather be seen as complementary in a strategic context.

To conclude, a digital strategy is a navigational tool for digitalization that is used to avoid digital disruption and to ensure long-term business prosperity in a digitally evolving business environment. Academia seems to stand united on the aggregative dimensional picture of digital strategy. There is however some minor variation in terms of the bundling and separation of its dimensional aspects, as well as in the exact denominations of these dimensions. It does however seem that the essence of the three dimensions of digitalization have digital strategy equivalents. Digitalization is about how companies

- reshape customer value,
- transform value creation, and
- enhance value deliverance

by introducing digital technologies and concepts. Digital strategy is about digitally enhancing the

- value proposition (reshape customer value),
- infrastructure and processes (transform indirect or direct value creation), and
- customer engagement (enhance value deliverance).

Since digital strategy is viewed as a tool used for navigating digitalization in a business context, it is also intuitive that its dimensions correspond to the dimensions of digitalization.

3.1.3 Digital Transformation

No industry will remain unaffected by digital transformation (Hess et al, 2016). With that said, it does not come as a surprise that digital transformation is a top priority on business leader's agenda (Bonnet et al, 2012). Bonnet et al (2012) highlight how nearly 90% of business leaders in the UK and US expect digital technologies and concepts to have increasing strategic impact on their business henceforth. On the other hand, Furr & Shipilov (2019) highlight how a senior vice president at a leading global company confess that as they had multiple digital transformation initiatives running and were going full steam on digital transformation, no one could explain what that actually meant.

There seems to exist discrepancies between using the term "digital transformation", knowing its inherent meaning, and simultaneously ensure that the readership or audience share a common

view. This probably holds true for more business and management concepts than just digital transformation. Business and management are all about big and hefty words, and to make simple things difficult. Nevertheless, Furr & Shipilov (2019) give the simple answer that digital transformation means "adapting an organization's strategy and structure to capture opportunities enabled by digital technology". Hess et al (2016) refer to digital transformation as "the changes digital technologies can bring about in a company's business model, which result in changed products or organizational structure or in the automation of processes". In some sense these perspectives are much similar to how academia discusses digitalization (e.g. Horváth & Szabó, 2019; Ritter & Pedersen, 2020), and even digital strategy (e.g. Berman, 2012; Sebastian et al, 2017). No wonder the discrepant use and confusion around these words.

While previous academic literature has done little to distinguish these words from one another, I believe that such a distinction is necessary. In this master thesis, digitalization refers to the trend of digital development. Digital transformation is the intentionally performed actions to accompany the trend of digitalization. These actions should preferably build along the guiding direction of the digital strategy. That is, the digital strategy sets the desired digital direction and position, and actions of digital transformation represents movement alongside this strategical direction – towards the desired digital position. Digitalization is a trend that is happening inevitably, but digital transformation is about how companies actively approach this digital development. This master thesis will apply the working definition of digital transformation as:

> *Carrying through digital initiatives to accompany digitalization with the goal of building towards the digital priorities set by the digital strategy.*

To digitally transform is to carry through digital initiatives, while digital strategy is about setting future digital priorities. This distinction is important since companies could perform excellent in terms of setting up digital priorities, but poorly in terms of executing digital initiatives – and vice versa. The distinction made in this master thesis enables companies to identify success factors and challenges in terms of these two dimensions separately.

3.1.4 Digital Drivers

Understanding digital drivers is vital since it could allow companies to predict potential transformations of their business environment (Andal-Ancion et al, 2003). A better understanding of digital drivers could also facilitate the process of choosing the right digital initiatives to engage in as well as setting the right digital priorities for the future. By understanding the digital drivers, companies could more easily build a proper digital strategy (Andal-Ancion et al, 2003). Digital drivers in this sense are

> *both external and internal aspects that affect the pace and direction of digital transformation for a company or industry.*

This also stands as the working definition of digital drivers for this master thesis.

In terms of identifying digital drivers, there are essentially two relevant areas: w*hat* are the drivers, and *who* is driving. Starting with *what*, the most apparent driver highlighted by academia seems to be the aspect of competition. Business is competitive by nature, and rather intuitively you cannot fall too far behind your competitors without risking existential threat (Lerch & Gotsch, 2015). Lerch & Gotsch (2015) also observe that digital has become a competitive tool, which could generate competitive advantages when used in the right way. That is, digital transformation is partially driven by competitive aspects.

On a fundamental level, companies intuitively approach change initiatives with strong and distinct business cases. This must hold true for all change initiatives, even digital ones. A strong and clear business case must therefore also be a digital driver. A strong and clear business case in this sense ultimately refers to a digital transformation initiative that obviously could increase revenue or cut costs, or in other ways improve the business.

Continuing with *what*, digital drivers could also derive from diffusion of innovation (DOI) theory. DOI theory refers to the ease and speed of adoption of new technologies (Rogers, 2003). The perceived easiness and quickness of adoption for a digital technology or concept could affect both pace and direction of digital transformation within a company and are therefore to be considered as digital drivers. The major characteristics of DOI proposed by Rogers (2003) are compiled in Table 2.

Table 2:
Rogers' (2003) proposed major characteristics of diffusion of innovations, interpreted as digital drivers

Driver	Explanation
Relative advantage	The degree to which a digital technology or concept could bring relative benefits to the organization compared to the current way of operating. (This confirms the business case aspect.)
Compatibility	The degree to which a digital technology or concept is compatible with existing business processes, practices and value systems.
Complexity	The degree to which a digital technology or concept is difficult to understand and use.
Observability	The degree to which the results are visible to others, e.g. customers, partners and competitors.

Academia also provides explicit digital drivers for new digital technologies and concepts, in a generalized context. Andal-Ancion et al (2003) has conducted case research of 20 large companies in North America and Europe across different industries to explore such digital drivers. The digital drivers proposed by Andol-Ancion et al (2003) are compiled in Table 3.

Table 3:
The digital drivers proposed by Andol-Ancion et al (2003)

Type of driver	Driver	Explanation
Inherent characteristics of value proposition	Electronic deliverability	Products and services vary in terms of compatibility with digital transformation. Reshaping the value proposition by leveraging digital technologies and concepts varies in difficulty.
	Information intensity	Products and services have varying complexity in terms of information and data. Value propositions that are information intensive could have more potential digital benefits.
	Customizability	The degree to which the value proposition could be customized to fit the preferences of individual customers could also motivate digital transformation. High customizability brings more potential digital benefits.
	Aggregation effects	Products and services differ in terms of how, and to what degree, they could be combined or integrated. Value propositions with higher degree of integrability bring more potential digital benefits.

Interactions between company and its customers	Search costs	Customer journeys that require vast searching from the customer bring more potential digital benefits.
	Real-time interface	If the deliverance of the value proposition heavily relies on real-time information, a digital transformation of the customer interface could result in substantial digital benefits.
	Contracting risk	Financial and product flows that puts the customer at risk could see substantial benefits as a result of digital transformation.
Interactions between company and its partners and competitors	Network effects	If an industry perceives a mutual need or realize mutual benefits of certain digital initiatives, these digital initiatives are more likely to be pursued. Such situations often lead to more intensive and extensive partnerships, ultimately resulting in value networks or digital ecosystems.
	Standardization benefits	Companies strive for efficiency, and process flows that could benefit from standardization bring more potential digital benefits. Such beneficial standardization effects could also have positive influence on the company's interaction with customers, suppliers and partners.
	Missing competencies	Companies could realize the need of new digital talent and skills. These missing competencies could be accumulated by utilizing alliances. Certain digital technologies and concepts could facilitate such alliances, and these are therefore more likely to be pursued.

There is also more specific academic research on sub-areas of digital transformation, such as industry 4.0. Horváth & Szabó (2019) have conducted a literature review considering driving forces of industry 4.0, which could be generalized into digital drivers for all digital technologies and concepts. The digital drivers that Horváth & Szabó (2019) highlighted from previous authors are compiled in Table 4.

Table 4:
The driving forces of industry 4.0 compiled by Horváth & Szabó (2019), generalized as digital drivers

Driver	Explanation
Growing competition	As proposed by various authors, digital transformation could be a way to gain a competitive edge, or at least a way to keep up with your competition. Competitive pressure is therefore a digital driver.
Increased innovation capacity and productivity	As digital technology and concepts become more accessible, and as their substantial benefits are proven, companies devote more capacity towards such innovative efforts.
Expectation of customers	The customer expectations of how their counterpart conduct business could be crucial in terms of their purchasing decision. The effects of digital transformation on the customer experience and customer journey could therefore act as a digital driver.
Efforts to save energy and improve sustainability	The trend of sustainable focus affects businesses and could also drive the pace and direction of digital transformation. Companies and industries that are under high sustainability pressures could be more driven towards digital technologies and concepts that relieve this pressure.

Financial and performance factors	As discussed before, strong and clear business cases could affect the pace and direction of digital transformation. Digital technologies and concepts that correspond to enhanced financial performance are more likely to be pursued.
Support for management activities	In a managerial context, digital technologies and concepts could facilitate decision-making, planning processes and other internal processes. Such digital technologies and concepts are more likely to be pursued.
Opportunity for business model innovation	Digital transformation comes with business opportunities, not only to increase revenue and cut costs but also to reshape the value proposition, alter the way value is created and enhance the way this value is delivered. That is, to innovate the business model. This could also be a digital driver.

To conclude the question of *what*, academia highlights numerous digital drivers. Academia does however provide little insights of what digital drivers to expect for the Swedish manufacturing industry. None of these drivers could therefore be excluded from the scope beforehand.

Moving on to the question of *who*, organizations have recently started to alter the way they structure themselves for digital transformation (Singh & Hess, 2017). This comes as a result of the paradigm shift in terms of the characteristics of digitalization (Dumeresque, 2014), as well as the overall increasing pressures of digital transformation (Gerth & Peppard, 2016). Digital transformation has become a vital management priority that requires new ways of thinking (Horlacher & Hess, 2016), which has paved the way for the emerging role of the CDO.

In contrast to the CIO, the CDO focuses on company-wide collaboration, initiating digital initiatives and cross-functional mobilization for these digital initiatives (Singh & Hess, 2017; Tumbas et al, 2017). A CDO does not replace the CIO (Gerth & Peppard, 2016), but could rather be a synergetic complementary role that reports to the CIO or directly to the CEO (Dumeresque, 2014). Ultimately, the CEO must also recognize the value that digital transformation could bring for a CDO to be effective (Gerth & Peppard, 2016).

While the CIO represents the strategic IT specialist, the CDO takes the role of the digital transformation specialist (Singh & Hess, 2017). The CDO's main purpose is to stimulate the entire company to take action towards the right digital priorities (Singh & Hess, 2017). Establishing the role of a CDO in an organization could be a digital initiative itself, and allow for better capturing of the opportunities brought about by digital technologies and concepts (Horlacher & Hess, 2016). As highlighted in 3.1.1, digital disruption can strike companies that do not have an adequate approach towards continuous digital transformation or a slow pace of digital adaption. The CDO could thereof be a digital initiative to counteract digital disruption (Singh & Hess, 2017).

Horlacher & Hess (2016) highlight that the CDO mainly focuses on the demand-side, with the goal of making the organization digitally empowered and customer driven. Through the role and responsibilities of the CDO, organizations can better exploit digital technologies and concepts to reshape the value proposition, transform value creation and enhance value deliverance.

To conclude the question of *who*, academia highlights the emerging role of the CDO. All companies do not have a CDO, at least not in terms of the explicit title. The responsibilities of a CDO do however exist for all companies, and intuitively these responsibilities could be shouldered by a combination of other roles as well. The way companies structure themselves in terms of facing digital transformation might differ, where some structures may allow for more effective and efficient approaches than others.

3.1.5 Digital Challenges

Digital challenges, as defined in this master thesis, refer to the

> *resistances, trade-offs and dilemmas that organizations face when building a digital strategy and engaging in digital transformation.*

The most apparent challenge is the difficulty to make sense of what and how to integrate and exploit digital technologies and concepts to your best advantage (Hess et al, 2016). From a managerial perspective, executives seem to struggle with setting the right digital priorities and choosing the right digital initiatives to pursue (Furr & Shipilov, 2019). This challenge could partially derive from that the trend of digitalization demands for high transformational pace (Ritter & Pedersen, 2020; Skog et al, 2018). Another reason could be the sole complexity of the digital technologies and concepts, which requires new skill sets within the organization (Bughin et al, 2018b; Lerch & Gotsch, 2015). We have also witnessed a paradigm shift in terms of the characteristics of digitalization (Dumeresque, 2014), which aggravates the already difficult situation. The sole complexity of digital technologies and concepts, or the lack of digital knowledge on a management level, could also make it more difficult to find and communicate the benefits and business case of a digital initiative (Staffaroni, 2019). If digital transformation cannot secure an adequate budget, the pace of digital transformation could be affected negatively. Ensuring investments that drive digital transformation could be a challenge.

Successfully formulating and acting in accordance with a digital strategy does come with additional complexities. There seems to be an interdependency in which the business environment affects companies' digital strategys, and each company's digital strategy affects the business environment (Mithas et al, 2013). This is rather intuitive since each company's business environment partially consists of other competing companies. This implies that a company's digital strategy needs to be relatively competitive compared to its competitors. Intuitively, this requires that the digital agenda and digital strategies of a company's competitors are known (Grover & Kohli, 2013). Grover & Kohli (2013) further analyze the complexity of this reasoning and concludes that not all digital initiatives will yield benefits in the long-term. The authors argue that by "revealing your hand" the relative benefits and potential competitive advantages could be undermined. That is, companies must find a balance between the visibility of their digital initiatives and the value generated by these digital initiatives in the long-term (Grover & Kohli, 2013). This reasoning further explains Furr & Shipilov's (2019) statements of how companies find it complex and confusing regarding which digital priorities to make and what digital initiatives to pursue. Furthermore, Gartner's senior vice president Valentin Sribar highlights how companies need to find their technology equilibrium – the techquilibrium (Panetta, 2019). Gartner (n.d. b) defines techquilibrium as

> *the balance point where the enterprise has the right mix of traditional and digital capabilities and assets, to power the business model needed to compete most effectively, in an industry that is being digitally revolutionized.*

Finding this balance point, the techquilibrium, is a challenge. The trade-offs and dilemmas that revolve around digital strategy and digital transformation are delicately complex.

Passing the stage of setting up the right digital priorities and choosing the right digital initiatives, the transformation itself is also challenging. Successful digital transformation, as all organizational transformation, requires change management. The importance of change management and critical success factors (CSF) for transformations are extensively discussed by academia (e.g. Näslund, 2013; Horváth & Szabó, 2019; Nah & Lao, 2001). Näslund (2013) discusses lean and Six Sigma in comparison to previous popular change methods and analyzes previous authors viewpoints on how to successfully approach these change methods. His conclusions were fourfold:

- First, with only slight variations, the CSF are similar for all the change methods.
- Second, the CSF seem to be relatively constant over time.
- Third, the CSF tend to relate more to how an organization approaches the change effort versus change methods specific factors.
- Fourth, the issues of management support and organizational culture are often emphasized as especially critical.

For more specific insights of how to successfully approach digital transformation, the attention is directed towards the forefront: management consultancy firms. McKinsey & Company, one of the world's leading firms in terms of supporting leading organization in their digital transformation journeys, has conducted several surveys and formalized their key takeaways in numerous articles. The accumulated insights and CSF of digital transformation from authors Boutetière et al (2018), Jacquemont et al (2015), Catlin et al (2017), Deakin et al (2019), Dahlström et al (2017), Bughin et al (2019) and Bilefield (2016) are as follows:

- Top management support and commitment
- Executives leading as role-models
- Clear goals and ambitious targets
- Defined roles and responsibilities
- Strategic alignment
- Project management and coordination
- Open and effective communication with a simple and clear language
- Training and/or acquire the right talent on all levels in the organization
- Build a culture of continuous change, a so-called digital culture
- Controlling, tracking and monitoring performance and progress

Boutetière et al (2018) state that transformation is hard, and that digital ones are even harder. This probably holds true. With over 70 percent of transformation programs failing, digital transformation is certainly a challenge (Jacquemont et al, 2015). The CFS for digital transformation are however essentially identical to the CSF that Näslund (2013) discusses in his paper. When it comes down to what specific challenges organizations must overcome to succeed with their digital transformation initiatives, it is all about the fulfillment of traditional change management CSF. This implies that Näslund's (2013) fourfold conclusion could be assumed to hold true for digital transformation as well.

To ensure business prosperity in the long-term, companies must continuously engage in digital transformation initiatives (Matt et al, 2015). Companies could gather momentum and be more efficient in their efforts of withstanding digital disruption by sequencing digital transformation initiatives (Dahlström et al, 2017). In this way, companies could soundly engage in digital transformation while ensuring a pace of transformation that supports long-term business prosperity. However, to gather momentum could also be a challenge.

An additional observation of the digital business era, is that companies seem to converge into digital value networks, also referred to as digital ecosystems (Weiss, 2018). A digital ecosystem, as referred to in this master thesis, is

> *a network of several organizations that aims to collaboratively reshape, create and deliver customer value by leveraging digital technologies and concepts, and by combining their digital resources, digital expertise and digital business opportunities.*

The creation of digital ecosystems is a result of that digital business opportunities cannot fully be supported and exploited by manufacturing companies in isolation (Weiss, 2018). Traditional and old manufacturing companies have had manufacturing of the physical product as their primary value adding activity – but this is not enough for capturing digital business value. As we are moving towards industry 4.0 and a big data-driven manufacturing era (Lee et al, 2014; Tao et al, 2018), manufacturing companies need to find partners and build networks that allow for capturing digital business value. These digital partnerships could ultimately result in a digital ecosystem. However, finding the right partnerships and ecosystems could be challenging (Weill & Woerner, 2015). The initiation of these digital partnerships and digital ecosystems often derive from urging digital business development that can only be enabled by establishing infrastructural platform technology (Alcácer & Cruz-Machado, 2019). Digital ecosystems enforced with digital platform technology could realize new digital business opportunities, in which its members could collaboratively reshape their collective value proposition, and simultaneously digitally enhance both value creation and value delivery processes (Rai et al, 2006; Heck & Vervest, 2007; Kenney & Zysman, 2016; Alcácer & Cruz-Machado, 2019).

The journey towards a more data-centric business comes with operational concerns as well. For example, the transition towards a big data-driven manufacturing environment comes with concerns of data governance (Khatri & Brown, 2010). That it, data ownership, data transparency, data accessibility, data integration, data security, cyber security and the generation of data insight. These data governance concerns could be challenging to overcome, especially with digital ecosystems that could result in complex interdependencies and interactions between multiple organizations.

To conclude, academia and practitioners highlight technological complexity, ensuring investments, the dilemma of "revealing your hand", techquilibrium, change management CSF, finding the right partnerships and ecosystems and data governance concerns as digital challenges.

3.2 The Exploring Digital Framework

The initial approach of this master thesis derives from widely accepted and established ways of setting up plans for organizational transformation and carrying through such transformation. This typically starts with mapping the current situation, often referred to the as-is. In the context of this master thesis, the as-is situation is instead referred to as the current digital state. Mapping

the digital state does not fall within the primary scope of this master thesis, but it does serve an important purpose of acting as a point of reference. A point of reference is an enabler for exploring digital strategy and digital transformation in a comparative fashion. For this purpose, the digital state does not require great detail, but is rather viewed as a high-level overview of the current digital situation.

When the digital state is known, the natural progression is to set up a goal or target in terms of a desirable future position or situation. This is often referred to as developing a to-be scenario. In the context of this master thesis, the to-be scenario is instead referred to as the digital vision. The to-be scenario is generally a concrete plan of a future state, whereas the digital vision is more of an idea. With both the digital state and digital vision known, we have both a starting point and an idea of a target end point. Drawing a line between the starting point and this idea of a target end point reveals a suggested direction of digital transformation. This direction resembles the desirable direction of digital business development, which could be realized by setting up digital priorities accordingly. The digital vision and its corresponding digital priorities resemble the desired future digital position and the desirable direction of digital business development. If formulated well, this could be seen as a company's digital strategy.

A company cannot approach its desired digital vision without engaging in concrete transformation initiatives. The natural progression is therefore to explore what current initiatives the company engage in. In the context of this master thesis, this is referred to as digital initiatives. The digital initiatives are guided by the digital priorities and aim to build towards the digital vision. Creating a digital vision, setting digital priorities and carrying through digital initiatives does not happen by itself. Someone and something must drive the change. That is, both a *who* and a *what.* In the context of this master thesis, *who* and *what* drive the pace and direction of digital transformation is referred to as digital drivers.

While making the digital transformation in accordance with the digital strategy, it is also relevant to identify what resistances, trade-offs and dilemmas that the company could face along the way. In the context of this master thesis, these are referred to as digital challenges.

The digital state, digital vision, digital initiatives, digital drivers and digital challenges altogether resembles the first of two dimensions of the Exploring Digital Framework. This dimension could be seen as a transformational dimension. The areas of this transformational dimension directly correspond to the research questions.

The second dimension of the Exploring Digital Framework derives from the literature review in the previous sub-chapter. In short, Ritter & Pedersen (2020) and Horváth & Szabó (2019) highlight the ambiguity of the buzzwords that surround digitalization. Furr & Shipilov (2019) emphasize the confusion that imbues organizations' efforts of becoming more digital, and how organizations perceive digital transformation and digital strategy as complex. Both academia and practitioners seem to agree upon that organizations struggle with setting the right digital priorities and pursuing the right digital initiatives. The working hypothesis of this master thesis is that this problematic situation partially derives from an absence of a tool that allows for exploring, navigating, and structuring organizations' approach towards becoming more digital.

By reviewing how academia and practitioners discuss the topics of digital strategy and digital transformation in a business context, it is safe to conclude that becoming digital is ultimately about customer value. The second dimension of the Exploring Digital Framework is therefore value-centric and inspired by Osterwalder's business model canvas (e.g. Osterwalder & Pigneur, 2011). Previous authors, such as Sebastian et al (2017), Berman (2012) and Hess et al

(2016), hint that the dimension of value could be broken down into the value proposition itself, the infrastructure and processes that directly or indirectly create value, and the way organizations engage with customers to deliver this value. These three areas are further described in Table 5, and collectively represents the second and final dimension of the Exploring Digital Framework.

Table 5:
A detailed description of the value-centric sub-dimensional areas and their respective inherent aspects

Sub-dimensional areas	Proposed denotation	Inherent aspects
The customer value itself	Value proposition	▪ Products ▪ Services
The indirect or direct creation of customer value	Infrastructure & processes	▪ Organizational structure ▪ *Supply chain ▪ IT infrastructure, platforms, and operational backbone ▪ Partnerships and ecosystems ▪ Skill sets and talent acquisition ▪ Manufacturing processes ▪ Supporting internal processes
The deliverance of customer value	Customer engagement	▪ Customer interface ▪ Customer interaction ▪ Customer journey ▪ Customer experience ▪ *Supply chain

**Note: The supply chain could support value creating activities, create value itself and obviously also be a part of the physical value deliverance*

By combining the transformational and value-centric dimension of digital transformation and digital strategy a matrix is formed. This matrix generates explorative, navigational and structuring questions concerning digital strategy and digital transformation. This is the Exploring Digital Framework, which is illustrated in Table 6 on the next page.

Table 6:
The Exploring Digital Framework – a tool for exploring, navigating, and structuring digital strategy and digital transformation

	Digital state Where are we now in terms of digital development?	**Digital vision** What are our digital priorities?	**Digital initiatives** What are we doing to approach our digital vision?	**Digital drivers** What and who are driving our digital transformation?	**Digital challenges** What are the resistances, trade-offs and dilemmas?
Value proposition Reshape value	What is the current digital state of our value proposition?	How do we envision our digitally reshaped value proposition, and what priorities correspond to this vision?	What digital initiatives are we pursuing to digitally reshape our value proposition?	What and who are driving the pace and direction of the digital transformation of our value proposition?	What resistances, trade-offs and dilemmas are we facing when digitally transforming our value proposition?
Infrastructure & processes Transform value creation	What is the current digital state of our infrastructure and processes?	How do we envision our digitally transformed infrastructure and processes, and what priorities correspond to this vision?	What digital initiatives are we pursuing to digitally transform our infrastructure and processes?	What and who are driving the pace and direction of the digital transformation of our infrastructure and processes?	What resistances, trade-offs and dilemmas are we facing when digitally transforming our infrastructure and processes?
Customer engagement Enhance value deliverance	What is the current digital state of our way of engaging with customers?	How do we envision our digitally enhanced way of engaging with customers, and what priorities correspond to this vision?	What digital initiatives are we pursuing to digitally enhance our way of engaging with customers?	What and who are driving the pace and direction of the digital transformation of our way of engaging with customers?	What resistances, trade-offs and dilemmas are we facing when digitally transforming our way of engaging with customers?

Chapter 4

Case Study

This chapter summarizes the empirical foundation of the case study. All empirical data are generated through a case study of two case companies. The empirics from each case company are presented separately and in a harmonized structure that follows the Exploring Digital Framework.

4.1 Company A

Company A believes that it is more digital than its competitors in general. This especially applies to the manufacturing processes, which are highly mature in terms of industry 4.0 related technologies and concepts. While the manufacturing processes are digitally mature, the value proposition is almost solely about hardware and the physical products as of now. The business characteristics of Company A and its industry does not necessarily benefit from digital customer engagement, which has resulted in less digital initiatives in this specific area. Company A pinpoints that being more or less digital than competitors is a broad question, and that it all depends on which specific area of business you refer to. *"No one is most digital in all areas – every major market player has its digital strengths and weaknesses".*

Becoming more digital is deemed a high priority for Company A. Company A believes that it is leading and driving the digital agenda in conversations with customers, partners, and competitors. Even though Company A sees itself as a digital leader, Company A believes that becoming more digital must certainly be a high or top priority for all companies. *"Becoming more digital could give you a competitive edge, which is something that all companies are continuously seeking".* According to Company A, becoming more digital is a game of which players that can become first movers and thereby set the tone and standards on the market.

A sign of that digital transformation is receiving growing attention in Company A, is that its IT budget has increased significantly during the last couple of years. At Company A, IT is not solely viewed as a supporting business function, but also as function of business opportunity. Company A views IT as a business enhancer that is integrated into all areas of business. Another sign of that digital transformation is a high priority is its perceived importance in the dialogues within the organization. *"All levels in the organization pay attention to digitalization".*

Company A has an explicit and deliberate digital strategy which is divided into six key areas. All these areas are substantiated with clear purposes that result in distinctive guidelines for what, when and how to engage in digital technologies and concepts. These six areas directly correspond to six team constellations that ultimately report to the CDO. Company A is continuously pursuing a stronger digital presence if it is motivated by its digital strategy. However, digital transformation must be value-adding and ultimately result in an enhanced business. *"We emphasize that the organization should not pursuit digital initiatives just for the sake of becoming more digital, every digital initiative must serve a business purpose".*

Company A's digital focus is twofold: (1) an external focus of realizing new business opportunities and finding new digital revenue streams, and (2) an internal focus to strengthen the organization through efficiency gains. In essence, this means either increasing revenue or cutting costs. Company A is striving to become as digital as possible by pursuing all initiatives for which this holds true.

4.1.1 Digital State

Value proposition
Company A's value proposition primarily consists of physical products in which the hardware makes up for most of its value. Today, most products are solely mechanical with negligible digital features. There are no digital service offerings in place.

Infrastructure & processes
"Becoming digital is not only about exploiting the most innovative and novel digital technologies and concepts, it is also about having the digital fundamentals in place". Company A puts emphasis on having the fundamental digital functionality in place. For example, this refers to having a proper VPN setup, which allows employees to access the intranet from locations outside the office. *"Lacking such basic functionalities could have devastating effects, especially when a pandemic strike and all employees must work from home".* Company A highlights that several partners are lacking in such areas, which aggravates the already strained situation concerning the Coronavirus outbreak.

The digital state of Company A's overall organization is deemed rather mature by the company itself. *"With several years of prioritizing digital development of the manufacturing processes, our manufacturing environment is advanced in terms of Industry 4.0 related digital technologies and concepts".* The supply chain is sophisticated and operates on a global level, but it is still of traditional nature and does not exploit any advanced digital technologies and concepts. The supporting internal processes are automated to a great extent, but not necessarily digitally enhanced. Overall, the organization structure supports digital transformation.

Customer engagement
Company A is not digital in its way of engaging with customers, and the overall customer experience is of traditional nature. The customer journey is that of a traditional large manufacturing company – sophisticated but conventional.

4.1.2 Digital Vision

Value proposition
Company A's future digitally enhanced value proposition has more digitally sophisticated products, in which all material and components have full traceability. *"Traceability means that*

errors and flaws could be identified more easily, and it could simultaneously counteract the use of altered products or incorporation of non-original components".

Company A also has a digital vision of growing its value proposition through digital services. There is a vision of building a platform as a service (PaaS) from scratch. This PaaS solution aims to be a digital extension of Company A's traditional physical products. Connectivity and traceability form the foundation for this PaaS offering.

There are also other concrete visions of a digitally enhanced value proposition, that altogether has the intent of revamping Company A's business model and create new digital business opportunities. Digital trends such as gamification could also play a role. *"These ideas of new digital services aim to reveal new digital revenue streams from both current and new customers".*

Infrastructure & processes
With infrastructure and processes being Company A's self-proclaimed digital strength, the digital vision mainly consists of doing more of what is already being done. *"We are already pretty digital. To become even more digital, we just have to do more of what we are already doing".* In Company A's case, this means to further develop the manufacturing processes. *"A next step for our manufacturing processes could be to make use of more advanced digital technologies and concepts such as AI and machine learning"*. Company A mentions that such applications could enable more accurate predictive maintenance for manufacturing equipment.

Company A hints that the supporting internal processes could be further digitally enhanced to achieve higher efficiency, but simultaneously pinpoints that these processes are already solid and well-functioning. Company A envision itself as a leading digital company. To achieve this desired digital position, Company A believes that it is crucial to further strengthen its way of developing digital skill sets and acquiring digital talent. *"There is a continuous need of deepening our digital knowledge and understanding".*

Customer engagement
This area does not receive high priority in Company A's digital strategy, but it is not completely neglected. Company A has a digital vision of enhancing its way of engaging with customers through increased transparency, for example by making its supply chain more digital and data-centric. Thereby, customers could get more timely and accurate delivery information. There is also a digital vision of better understanding the end user through behavior analysis by utilizing big data and AI. *"Digital is about gathering and making use of data".* Company A also highlights that digital efforts in the value proposition dimension and the infrastructure and processes dimension contribute to an improved customer experience. Thus, Company A aims to better its customer engagement by digitally enhancing the value proposition and the infrastructure and processes. Company A refers to this as a positive spillover effect.

4.1.3 Digital Initiatives

Company A is multi-prioritizing what it deems as critical projects. Multi-prioritizing in this sense means either sequencing projects or letting them run in parallel. This approach is utilized regardless of which area of the business model that is being digitally transformed.

Value proposition
Company A is currently building a digital platform that through collected real-time data could generate a digital service offering to customers. This platform, or PaaS, will be connected to

the current products, thus making them digitally active. The platform will utilize cloud-based intelligence that through machine and deep learning could make use of automated speech recognition and natural language understanding. This aims to generate insights of customer behavior. *"Better knowledge of how the end users are behaving could reveal new business opportunities for us".*

Infrastructure & processes
Company A is establishing a governance model for digital transformation initiatives. This governance model aims to facilitate organizational alignment through clear directives and strategic direction. *"Our new governance model will further facilitate planning, transforming and follow-up activities, thus speeding up digital transformation while simultaneously ensuring that transformation is happening in accordance with the digital strategy".* The CIO of Company A has recently shouldered the role of a CDO, which was done to clarify the ownership and leadership of digital transformation.

To further strengthen the infrastructure, new datacenters are going to be established. These new datacenters may enhance current cloud capabilities. *"These datacenters are enablers for value creation through the new platform as a service initiative".*

Company A proclaims that it is not lacking in digital skill sets, but simultaneously emphasizes that digital talent acquisition runs as a continuous initiative. This aims to further strengthen the digital organization and facilitate digital value creation.

Customer engagement
No significant digital initiatives are taken at this time. However, Company A again emphasizes that efforts in the other two dimensions aim to improve the customer experience.

4.1.4 Digital Drivers

The overriding digital driver for Company A is the business case. That is, to increase profit by either reducing costs through efficiency gains or increasing revenue by creating new business opportunities. Implementation speed and cost-benefit presentiments are also overriding key digital drivers for digital initiatives.

The CDO is ultimately responsible for setting both pace and direction for all areas of digital transformation.

Value proposition
Company A has both internal and external digital drivers. The digital drivers that derive from the inherent characteristics of the value proposition are fundamental. *"On a fundamental level, ensuring functionality and safety of our products are considered key digital drivers".* Looking at external digital drivers, customers are demanding higher traceability of components in the end user product. This calls for prioritization of digital initiatives that fulfill customer expectations.

Company A highlights its efforts of differentiating its value proposition from that of its competitors'. *"By digitally reshaping the value proposition to deliver unique value to the customer, we are hoping to achieve a competitive advantage".* Such go-to-market-aspects are certainly driving both pace and direction of digital transformation. Speed-to-market aspects are also influencing what digital initiatives Company A pursue and are thus viewed as digital drivers.

Infrastructure & processes
"Top management is primarily looking for efficiency gains when setting priorities for digital transformation of our infrastructure and processes". Further digital development of manufacturing processes is driven by desired efficiency gains and increased reliability. *"Key customers are often invited to the manufacturing facilities to see how digital and smooth our production is. For such instances, reliability of the manufacturing processes is especially critical".*

Another digital driver that Company A pinpoints is to be prepared for the future. "*Whatever might come our way in terms of digitalization, we must be ready"*. Company A emphasizes both further development of existing skill sets and acquisition of new digital talent as key. *"To be competitive tomorrow, we must develop the right skill sets and acquire the right digital talent today"*.

Customer engagement
Company A highlights that growing competition is expected to cause a trend of growing digital attention of this area. In addition to this, Company A emphasizes that meeting customer expectations is critical. *"It all comes down to meeting customer expectations".* On the other hand, Company A does not see any current customer expectation not being met in this area. According to Company A, this further motivates the lack of direct effort in digitally enhancing customer engagement.

4.1.5 Digital Challenges

Value proposition
Company A emphasizes that digital challenges rarely originate from the top, but rather from lower levels in the organization. *"Since becoming more digital is a high priority, ensuring top management support for digital transformation is easy. What is more difficult is to achieve support downstream. Everyone wants to have their say"*. As the organizational culture and prestige of employees revolve around mechanical expertise, it is difficult to get the lower levels in the organization onboard in pursuing a more digital value proposition. *"Moving towards a more digital value proposition requires a change in mindset and cross-functional alignment. These aspects are critical challenges"*.

"Setting a direction for digital development is not necessarily difficult, but the digital transformation itself is". Top management has established a digital strategy and is supporting digital initiatives that are aligned with this strategy, both verbally and financially. On the other hand, having a lot of potential digital initiatives do bring challenges in terms of focusing the efforts. *"We have so many things we could do that it is sometimes difficult to know what to do first".*

Company A does experience significant challenges when carrying through digital transformation of the value proposition. An example of such a challenge is the balancing of new digital talent with already existing expertise and experience. *"Junior and senior employees must be effective in their communication and use each other to achieve the greatest possible combined capability".* Company A emphasizes that achieving consensus within the organization is both necessary and difficult when digitally reshaping the value proposition.

Infrastructure & processes
Company A encourages employee initiatives and opinions, which sometimes could generate overwhelming input regarding strategic questions. *"Everyone wants to have their say about the*

company's future direction of digital development". Although employee input is truly valuable, too much and scattered input could lead to disorientation and a lack of focus. The governance model discussed earlier was established to manage such challenges. Despite having a governance model, focusing efforts and setting priorities for the near-term are still challenging. *"Much can be done, and much should be done, but what should we focus on right now?*".

Company A further highlights a dilemma, in which the organization wants fast digital progress and simultaneously see a proof of concept before giving a go-ahead for digital initiatives. As much as this gateway approach slows down digital transformation, it is also necessary for ensuring that the right digital initiatives are being pursued at the right pace. *"Sometimes we are too expeditious when pursuing digital initiatives. Taking a step back and thinking it through could surely lead to more smooth digital transformations".* Company A exemplifies this challenge with an infrastructural IT transformation that was rolled out globally in a rushed fashion. This led to an extended implementation time and an overall troublesome transformation. *"Digital transformation is about starting small and scaling up gradually".*

Furthermore, change management is also a challenge when carrying through digital transformation. *"There has to be consensus regarding the direction of digital development. It is difficult to get everyone onboard and even more so to get everyone to pull in the same direction".* Company A also notices an organizational desire of wanting to be unique, while simultaneously realizing that customizing infrastructure and processes could undermine targeted efficiency gains in the long-term. *"Every organization believes that it is so unique, but one has to put pride aside and opt for standardization to maximize long-term efficiency benefits".*

Customer engagement

Company A highlights the difficulty to grasp customer expectations, which in turn increases the complexity of meeting them. To conclude, Company A emphasizes that the outcome of this dimension rather lies in the combined outcome of the other two dimensions, meaning that challenges for the other dimensions also stand as challenges for this dimension. Company A describes it as being digital in terms of value proposition, infrastructure and processes causes a digital spillover effect on the customer experience. This spillover approach is however not without complexity. *"However, to realize this positive spillover effect is certainly challenging in practice".*

Table 7:
The Exploring Digital Framework – an empirical overview of Company A's digital agenda

	Digital state Where are we now in terms of digital development?	**Digital vision** What are our digital priorities?	**Digital initiatives** What are we doing to approach our digital vision?	**Digital drivers** What and who are driving our digital transformation?	**Digital challenges** What are the resistances, trade-offs and dilemmas?
Value proposition Reshape value	▪ Mainly physical products ▪ The value lies in the hardware	▪ Connectivity and traceability ▪ Make products digitally active ▪ Enable digital identification of errors, flaws and wrongful altering ▪ Revamped business model ▪ Servitization through platform and data as a service ▪ Exploit digital trends, e.g. gamification	▪ Building a digital platform to enable digital service offering ▪ Generating insights of customer behavior through automated speech recognition and natural language understanding ▪ Multi-prioritizing initiatives	▪ CDO is driving digital ▪ Ensuring functionality and safety ▪ Customer expectations ▪ Differentiation from competitors ▪ Go-to-market aspects ▪ Speed-to-market aspects ▪ *General drivers	▪ Achieving support downstream ▪ Overcoming prestige ▪ Organizational culture ▪ Cross-functional alignment ▪ Focusing the efforts ▪ Balance new digital talent with existing expertise
Infrastructure & processes Transform value creation	▪ Digital fundamentals are in place ▪ Self-proclaimed digitally mature ▪ Industry 4.0 is in place ▪ Organization structure supports digital transformation ▪ Supply chain sophisticated but traditional ▪ Supporting internal processes are automated but not necessarily digitally enhanced	▪ Doing more of what is already being done ▪ Utilizing AI and machine learning for more accurate predictive maintenance ▪ Digitally enhance supporting internal processes ▪ Strengthen way of developing digital skill sets and attracting new digital talent	▪ CIO has explicitly shouldered CDO responsibilities ▪ Establish governance model for digital transformation initiatives ▪ New datacenters ▪ Strengthen approach for recruiting digital talent ▪ Multi-prioritizing initiatives	▪ CDO is driving digital ▪ Customer expectations ▪ Process reliability ▪ Prepare for uncertain digital future ▪ Growing competition ▪ *General drivers	▪ Balance employee input with top management authority ▪ Achieve consensus ▪ Change management ▪ Focusing the efforts ▪ Setting near-term priorities ▪ Not rush digital initiatives ▪ Cross-functional alignment ▪ Prove the business case ▪ Trade-off between standardization and customization
Customer engagement Enhance value deliverance	▪ Sophisticated but conventional overall ▪ Traditional but non-digital customer journey and experience	▪ Not a primary focus ▪ Make supply chain more data-centric for timely and accurate delivery information ▪ End user behavior analysis ▪ Digital Value proposition and Infrastructure & processes indirectly digitally enhance Customer engagement – positive spillover effect	▪ No significant ongoing digital initiatives	▪ CDO is driving digital ▪ Growing competition ▪ Competitive advantage ▪ Customer expectations – but these are already believed to be met ▪ *General drivers	▪ Grasping and meeting customer expectations ▪ Using digital advancements in the Value proposition and Infrastructure & processes to strengthen Customer engagement. That is, to realize positive spillover effect

*Note: Company A notes general drivers: business case, efficiency gains, new business opportunities and ease of implementation

4.2 Company B

Company B does not perceive itself as digital but puts emphasis on its digital potential. When performing digital assessments of the organization, Company B scores between 1 and 1.5 on a 0-5 scale. A 0 would imply that the company is not digital at all, meanwhile a fully digital company would get a score of 5. As it is difficult to get insights of how digital direct competitors are, Company B cannot fully clarify its relative digital position. *"My guess is that we are somewhat more digital than our traditional competitors, but definitely less digital than the newer and more innovate players".* Company B is continuously performing digital benchmarking against non-competitors that have similar company characteristics as itself. Benchmarking against non-competitors is enabled by the mutual winnings of learning your digital strengths and weaknesses, without having to reveal digital business plans to direct competitors. Thus, the risk of hurting your business interests is mitigated. Such partnerships are based on confidential information and rely heavily on trust, but also legal commitment.

Some areas of the organization are believed to have come further than others, with the online customer journey being one of those areas. *"We have both stronger and weaker digital areas, and our online customer journey is definitely classified as one of our strongest".* On the other side of the spectrum, Company B notes its manufacturing processes as lagging in terms of digital development, but simultaneously hints a not so distance target of complete smart manufacturing. The value proposition lies somewhere in between but continues to receive growing attention.

Becoming more digital is a hot topic in Company B's industry and is believed to have an immense impact on how future business is conducted. *"This is an area in which all companies want to invest".* Company B has digital transformation as a high priority, and this is communicated both internally and externally. Generous budgets for digital initiatives further strengthen digital transformation as a high priority area. Despite having digital transformation as a high priority, Company B deems itself as a digital follower at best. *"We are definitely not leading nor lagging, but rather somewhere in between. Probably more towards the lagging side of the spectrum".* As much as Company B appears skeptical about its current digital presence, its belief in a brighter and stronger digital future should not be undermined. *"If we succeed with all digital initiatives that are set to take place in the near-term, we will leap ahead into a leading digital position".*

While Company B appears confident in its digital potential, there is a lack of directional consensus. Company B does not have an explicit digital strategy. *"There is no company-wide digital strategy"*. Top management communicates that the organization should digitalize but does not provide any clarifying and guiding directives. *"Every business unit is responsible for its own pace and direction of digital development. We are just hoping that all business units pull in the same direction".* This is however not the case. The lack of an explicit company-wide digital strategy has resulted in scattered, misaligned and out of step digital advancements. This issue is widely noted by the company itself, and so is the disorientation that comes consequently. *"We are executing and developing our digital strategy simultaneously"*.

Not having a clear set of guiding directives result in a trial and error approach for digital transformation, in which focus is shifting over time. Company B exemplifies this issue by its recent shift in digital focus, from front-end to back-end. *"We have realized that the back-end fundamentals must be in place before enjoying the front-end benefits".* In this context, front-end refers to delivering greater value through a digitally improved interaction with customers,

with front-end benefits meaning new business opportunities and increased revenue. Back-end refers to the enabling infrastructure and processes, as well as a digitally enhanced value proposition. Although Company B puts emphasis on being customer-centric in its digital efforts, it is clear that one cannot deliver value that is not digitally substantiated by the infrastructure, processes and value proposition.

Company B aims to become as digital as possible, but only if it is aligned with its lean way of operating and doing business. *"If becoming digital means efficiency gains such as reduced waste and downtime in manufacturing, we want to become as digital as possible".* Efficiency gains are not the only determinants for digital engagement. *"The customer is always in focus, and an improved customer experience is surely an adequate argument for becoming more digital"*. Company B advocates all digital initiatives that either results in internal efficiency gains or betters the customer experience.

4.2.1 Digital State

Value proposition

Company B's value proposition primarily consists of its physical products. That is, hardware. *"We are a manufacturing company with industrial products, which in essence are lumps of metal".* There is no substantial digital service offering. *"We are not selling any digital services as of now. Our current value proposition has a low level of digital substance".*

Infrastructure & processes

The infrastructure and processes are digitally lacking for Company B. By conducting digital assessments of the organization, Company B knows that its overall digital maturity is between 1 and 1.5 on a scale of 0-5.

Looking at the manufacturing processes, some equipment is connected, but none are digitally interconnected. That is, some equipment can generate basic data, but solely in an isolated fashion. Data cannot be aggregated nor visualized in a way that generates valuable insights. Thereof, the manufacturing processes of Company B are not digital. Company B also highlights the difference between automation and digitalization. *"Do not get automation and digitalization confused. Our processes are mostly automated, but certainly not digital".* This especially applies to the supporting internal processes, which are mostly automated and sophisticated but not yet digitally enhanced. Company B does however highlight that some of its supporting internal processes require a human hand. The supply chain is traditional and sophisticated, but not digital.

Company B has a decentralized organizational structure for digital transformation, in which every business unit has sole responsibility for digital advancements. This decentralized approach is not necessarily a conscious choice, but rather a representation of Company B's lack of structural digital initiatives. *"We are a large and old company, and our decision-making processes regarding restructuring for central ownership are slow. It is not that we do not want to, it is just that we have not done it yet".* All in all, Company B is lacking digital presence within their infrastructure and processes.

Customer engagement

Company B has an e-business solution, and the customer journey up until and including the purchase is digital. Customers can request a digital representation of a product to ensure compatibility with their systems, and digitally receive customized product information through a digital product configurator before making the purchase. After the purchase is made, the

digital customer experience declines. Since the supply chain is not digital, customers cannot get timely and accurate information at all stages of readiness in production, nor can they get delivery information at all stages of transportation. Customization, modification, and updates of a product in the aftermarket does not automatically lead to updated and digitally accessible product information. This is partially a consequence of lacking product connectivity and traceability. *"Servitization of the aftermarket has great potential, but we are not able to tap this potential yet".* The current digital state of Company B entails a missed-out potential in the aftermarket, but also difficulties in enticing buyers. *"We could definitely be more digital in our way of enticing buyers".* All in all, this sums up to a partially digital customer experience.

4.2.2 Digital Vision

Value proposition

Company B's future value proposition is digitally extended, where products are digitally active and complemented by a new digital service offering. Connectivity of products seems to be fundamental, as aggregated data from different kinds of sensors enables the creation of a digital service offering. *"It is not only about connecting your products, it is also about making use of this connectivity from a business perspective".* Company B emphasizes that it is simple to connect products, but rather difficult to realize the business potential of connectivity. Another fundamental area of Company B's future value proposition is traceability. By making components and products digitally traceable, accurate and updated product information could be provided and additional digital service offerings could be created. This digital service offering means extended features that are accessible by scanning QR codes.

Connectivity and traceability combined will in turn enable digital twins. Company B refers to digital twins as advanced digital representations of the physical product. A digital twin could be used to digitally monitor, measure, and control the physical product from afar.

Infrastructure & processes

As Company B recently shifted focus from front-end to back-end, the infrastructure and processes are now receiving growing attention. Company B has a digital vision of production facilities being completely connected and digital. This means that data can be collected, analyzed, and visualized to generate insights and ultimately predictive capabilities. In turn, these insights and predictive capabilities should generate self-executing actions for manufacturing equipment, resulting in completely smart manufacturing. According to Company B, this smart manufacturing vision is not as distant as it may sound and could partially be enabled by recent advancements in edge computing and cloud capabilities.

As a company with a lean mentality, reducing waste in all processes is always a part of the vision. *"By enhancing our digital capabilities, we can reduce waste in manufacturing processes and along the supply chain".* Smart manufacturing in combination with a more digitally aware supply chain are thereby key building blocks of Company B's digital vision. Company B also highlights various uncertainties in the direction and pace of future digital development. *"Our new digitally enhanced infrastructure must ensure future compatibility and digital flexibility. When new digital technologies and concepts arise, we must be able to incorporate these in a plug-in-and-play fashion".*

Company B acknowledges the threat of digital disruption and puts emphasis on that the organization structure must support digital transformation both effectively and efficiently. *"In the future, we want our organization to stand united in its efforts of becoming more digital".*

To turn the entirety of this digital vision into reality, Company B believes in learning by experience. Company B wants to put its vision to the test on a small scale, prove the concepts, and then scale up gradually. Becoming more digital is not done in isolation, but rather with the help of partnerships. *"Digital will change how we do business, and we have to partner up and form the right digital ecosystems to make this a change in our favor".*

Customer engagement
With Company B being rather digital up until and including the initial purchase, its digital vision is mostly concentrated on bettering its digital presence in the aftermarket.

To unlock the digital potential of the aftermarket, Company B puts emphasis on getting closer to the customer. *"It is all about getting closer to the customer and establish a sense of mutual comfortability".* By ensuring connectivity and traceability of products and components, self-diagnostics and predictive maintenance could reveal new business opportunities. This could result in a more sophisticated and close relationship with customers, in which Company B becomes their natural aftermarket service provider. *"Digitally enhanced products bring new opportunities for customer interaction".* Company B further exemplifies how a digitally extended value proposition with QR codes could improve customer engagement. *"Our way of interacting with customers could be further improved by utilizing QR codes on all products".* The QR codes could initiate digitally interactive sequences, in which the customers could get guidance on how to perform maintenance and easily order new spare parts based on self-diagnostics. Company B does however put emphasis on preserving the human characteristics in most business conversations. *"Our customers are not necessarily tech savvies. They want to do business with a human, not a robot".* Company B's digital vision involves creating a digital customer experience in which the customers do business with a robot, but thinks they are doing business with a human.

Company B pinpoints future customer interaction as more bidirectional. *"It is not only about us providing customers with accurate and timely information, it is also about making customers comfortable in sharing data with us".* This seems to be key for approaching Company B's digital vision. *"We and our customer could certainly find mutual winnings in bidirectional sharing of data".*

4.2.3 Digital Initiatives

Value proposition
Company B is currently performing small scale testing of connectivity solutions for various products. This can be viewed as a first step towards a digitally extended value proposition. *"We are currently in a conceptual stage in which we want to prove this possible to ourselves".* Technological digital initiatives have been prioritized in this area, but Company B highlights a lack of initiatives to explore the business aspects. *"We have come far in terms of technological development, but we have not pushed the corresponding business-related aspects as far".*

In collaboration with the customer engagement area, QR codes has recently been incorporated in various products. By scanning the QR codes, customers can receive product information, manuals, and lists of spare parts. As this is further developed, it aims to reveal new business opportunities in the aftermarket in accordance with the digital vision.

Infrastructure & processes
With the recent shift in focus from front-end to back-end, digital initiatives regarding the infrastructure and processes are of top priority. Company B is currently running small scale

testing of smart manufacturing solutions to prove the concept's viability. There are also projects running regarding system support and the establishment of required IT infrastructure for such digitally enhanced manufacturing processes. *"We are trying to find viable technological solutions to make all processes data compatible on a company-wide level".* Company B emphasizes that changes in the organization's way of operating will entail. *"Our organizational mindset must change as we become more digital".*

Company B's organization is certainly going through change, not only in terms of mindset, but also in structure. As the organization struggles to align its digital efforts, structural initiatives to counteract this have formed. Company B has recently established centralized cross-business unit groupings in areas that are of mutual interest across all business units. So far, there are two such central groupings, one for connectivity of products and one for online sales. The goal of these structural initiatives is to eliminate scattered digital efforts on a company-wide level.

Company B is continuously upskilling and reskilling employees, while also acquiring and training new digital talent. *"To succeed in becoming more digital, we must combine knowledge of our existing business with innovative ideas about our future business".* In addition to building a foundation of digital competence, there are also initiatives running to make external advancements. Company B is building scenarios for partnerships and digital ecosystems. This is done based on a belief that digital will change both how business is conducted and the overall market structure. *"The future of business is more digital, and digital will change how we conduct business".*

Customer engagement
Current digital initiatives revolve around exploring the aftermarket potential of digitally enhanced customer engagement. With servitization of the value proposition, QR codes are now placed on most products. These QR codes enable a close and continuous interaction with customers in the aftermarket. *"When customers scan the QR code, a dialogue about all conceivable services are accessible on demand".* Company B is currently familiarizing itself with the technology and its effects on the customer experience, while simultaneously discussing concepts of how the service offering should be constructed and further extended. Company B is also familiarizing its customers with its recent digital advancement by introducing them to an initial digital service offering. Business model implications of this new way of interacting with customers are still under investigation.

4.2.4 Digital Drivers

Company B does not have an explicitly defined ownership of the digital agenda on group level. Every business unit is solely responsible for setting the pace and direction of digital development. That is, the management team of each business unit drives digital.

Value proposition
Company B is pursuing its digital vision because of a presentiment of enormous cost savings. Digitally enhanced products and servitization of the value proposition could make the customer more independent, leading to both efficiency gains and increased revenue. Such business cases are key digital drivers. It is also believed that digitally reshaping the value proposition could result in a competitive advantage while simultaneously reveal new digital business opportunities in the aftermarket. Increased functionality and product quality are also digital drivers.

Infrastructure & processes
Digital advancements of infrastructure and processes are partially driven by the realization that they are prerequisites for receiving front-end benefits. *"We cannot have an attractive and digital offering without the supporting infrastructure and processes".*

As Company B is striving to become leaner in its way of operating, efficiency gains in terms of cost savings and reduction of lead times are also key digital drivers. *"Becoming more digital is a way for us to become leaner".* Looking at the manufacturing processes, improvements of any key performance indicator (KPI) related to manufacturing could also be driving factors.

Looking at more qualitative aspects, Company B mentions employee safety and an overall improved working environment as digital drivers. In addition to this, there is also a clear emphasis on that meeting customer expectations is a digital driver. *"It is critical that our customers know that we have full control over all of our processes".*

Customer engagement
A key digital driver for customer engagement is that Company B's customers want to lower their administrative burden. *"Our customers want it to be easy to do business with us, and easy often means more digital"*. Company B underlines that the solution to meeting these customer expectations is all about getting closer to the customer. *"We must be close to our customers, not necessarily physically but always digitally"*. By being digitally accessible and having accurate information available on demand, Company B realizes twofold front-end benefits. *"Firstly, customers do more of the work themselves, which lowers the cost to serve for us. Secondly, when customers get more independent and can access accurate information, their administrative burden plummets and the ease of doing business skyrockets. Digital facilitates business"*. Thereof, both cost savings and business facilitation are key digital drivers.

Making customer engagement more digital could also generate a competitive advantage. *"Becoming more digital leads to a more innovative image, which in turn can generate a competitive advantage".* Company B highlights that a more innovative image could facilitate customer attraction, but also the attraction of new employees and business partners. *"No one wants to partner up and do business with a digital laggard"*. Competitional aspects as well as enabling new business opportunities could thereby be considered as digital drivers. In addition to this, Company B emphasizes efficiency gains and making more money as drivers for digital advancements. That is, the business case is also a digital driver.

4.2.5 Digital Challenges

Value proposition
Having a non-digital value proposition in an industry that is making rapid digital advancements implies various challenges. *"We are in digital debt. That is one of our main challenges right now. We have not made enough digital advancements in recent times, and now we have to push for numerous digital initiatives all at the same time".*

Company B does however feel confident in its technological capabilities but finds business aspects challenging. *"Most technological aspects are in place, but the business aspects are not. We can do all the technical things, but how do we make a business out of it? How do we turn it into an appealing digital service offering that customers want to pay for? How much should they pay? How should they pay?"*. Realizing business opportunities and reinventing the business model are key digital challenges for the value proposition.

Being a large company, it is challenging to achieve consensus among all business units. *"We must find common ground and align our efforts".* Aspects of organizational culture also come into play when making the shift from a value proposition that revolves around hardware, towards a digitally enhanced value proposition that revolves around servitization.

Infrastructure & processes

Being a large company also imposes challenges for digital advancements regarding infrastructure and processes. The most apparent challenges are to find effective and efficient ways of structuring the organization and governing digital transformation. *"We should have had a central organization in place to ensure alignment of digital efforts a long time ago".* This results in problems regarding focusing and coordinating digital efforts.

Looking at business unit level, there are also issues with cross-functional alignment. Digital transformation of the manufacturing processes requires IT and operations to work together, which is easier said than done. *"Smart manufacturing requires that IT and operations work closer than ever. Initially, it felt like IT and operations were of two different worlds that could not communicate or understand each other. Operations did not know what IT did, and IT did not know what operations did. Smart manufacturing is about integrating these two worlds, and that is challenging".*

Company B also highlights challenges with proving the business case for digital initiatives. Such challenges are believed to be anchored in the organizational culture of being a manufacturer of mechanical devices. *"Traditional technology projects of mechanical nature could get an allocation of 20 MSEK and have a runtime of two years, but innovative digital initiatives with budgets of 3 MSEK that has the same runtime are not prioritized".* Organizational culture, setting the right digital priorities, and ensuring investments are thereby considered as digital challenges. In addition to ensuring investments, Company B also pinpoints challenges with establishing a proof of concept. That is, to prove expected benefits. *"Big budgets must be matched by big benefits".*

As much as Company B emphasizes its competence and self-confidence in its traditional and conventional business, it is also evident that there is lacking competence in the area of digital. *"This is new to us. We do not have any previous experiences to rely on, and this makes us impatient as we struggle to ask ourselves the right questions about how to become digital".* This impatience sometimes results in Company B rushing digital initiatives, or not taking any initiatives at all. There is also a glimpse of frustration towards top management. *"I cannot say that top management is ignorant, but there is certainly a learning curve for the entire organization. This also includes top management"*. Digital ignorance, to not have enough digital understanding to realize business cases and the potential of becoming digital, is a significant challenge for Company B. Building trust in the organization's capabilities is therefore also challenging.

Customer engagement

A digital challenge for the sales side of Company B is the shift in mindset that is required when becoming more digital. *"It is difficult to make the shift from only selling hardware to also selling software, and from only selling products to also selling services. Our internal mindset must change".* Company B highlights that this shift requires a revamp of the business model, which is considered a major digital challenge for all areas of business.

Understanding the customer journey and customer experience are digital challenges for Company B. *"Understanding the customer is all about data. Everything is data-driven, and we*

do not have our data set-up perfectly in place yet". This results in difficulties in meeting customer expectations. *"Customers are now demanding things we though they would never want".* In addition to this, Company B yet again highlights that its customers appreciate the feeling of human interaction when doing business. *"We cannot lose the human characteristics in our way of engaging with customers as we become digital. The human interaction induces a personalized and familiar feeling".*

Table 8:
The Exploring Digital Framework – an empirical overview of Company B's digital agenda

	Digital state Where are we now in terms of digital development?	**Digital vision** What are our digital priorities?	**Digital initiatives** What are we doing to approach our digital vision?	**Digital drivers** What and who are driving our digital transformation?	**Digital challenges** What are the resistances, trade-offs and dilemmas?
Value proposition Reshape value	▪ Mainly physical products ▪ The value lies in the hardware	▪ Connectivity and traceability of products and components to enable new digital service offering ▪ Digital twins ▪ Servitization of aftermarket ▪ Extended QR code offering ▪ Reinvent the business model	▪ Conceptual stage of testing connectivity solutions ▪ Lack of initiatives that explore business aspects ▪ Incorporating QR codes in various products to enable digitally enhanced customer interaction	▪ *See note for digital driver ▪ Business case ▪ Efficiency gains with cost savings ▪ Increased revenue ▪ New business opportunities ▪ Increased functionality and quality ▪ Competitive advantage	▪ Digital debt – much must be done at the same time ▪ Realizing business opportunities ▪ Reinvent business model ▪ Organizational culture ▪ Change management ▪ Strategic consensus/alignment
Infrastructure & processes Transform value creation	▪ Digital assessments show low digital maturity ▪ Smart manufacturing in conceptual stage ▪ Organizational structure induces scattered digital efforts ▪ Supply chain sophisticated but traditional ▪ Supporting internal processes are automated but not necessarily digitally enhanced	▪ Smart manufacturing ▪ Edge computing and cloud capabilities ▪ Leaner operations through digital transformation ▪ Flexible processes that are plug-in-and-play-compatible with future technologies ▪ Unified organization structure that supports digital transformation ▪ Partnerships and digital ecosystems ▪ Learning by experience	▪ Small scale testing of smart manufacturing solutions ▪ Establishing system support and IT infrastructure for smart manufacturing processes ▪ Centralized company-wide groupings for connectivity and online sales ▪ Upskilling and reskilling ▪ Scenario-building for partnerships and digital ecosystems	▪ *See note for digital driver ▪ Business enabler ▪ Prerequisite for front-end benefits ▪ Efficiency gains, with cost saving and lead time reduction ▪ Employee safety ▪ Better working environment ▪ Customer expectations ▪ Process reliability ▪ All manufacturing KPIs	▪ Digital impatience ▪ Overcoming anchored prestige in organizational culture ▪ Proving business case and concept ▪ Ensure investments ▪ Lack of trust in capabilities ▪ Digital ignorance, missing competencies, and frustration ▪ Strategic alignment ▪ Cross-functional alignment ▪ Lacking governance and ownership ▪ Focusing efforts and coordinating activities
Customer engagement Enhance value deliverance	▪ Digital up until and including the purchase ▪ Lacking digital presence in the post-purchase customer experience ▪ Missed-out potential of servitization in aftermarket	▪ Bidirectional sharing of data ▪ Tap aftermarket potential through a digitally enhanced customer dialogue ▪ Digital customer experience without losing human characteristics ▪ QR codes as key enabler	▪ Exploring aftermarket potential ▪ Familiarizing the organization with servitization ▪ Familiarizing customers with servitization and QR code technology ▪ Investigating business model implications of current initiatives	▪ *See note for digital driver ▪ Lower administrative burden ▪ Ease of doing business ▪ Make customer independent to lower cost to serve ▪ Customer expectations ▪ Innovative image to get competitive advantage ▪ Business case ▪ New business opportunities	▪ Shift in mindset ▪ Revamp business model ▪ Realizing and meeting customer expectations ▪ Getting data set-up in place for bidirectional sharing of product and customer data ▪ Becoming digital without losing human feel of business

*Note: The management team for every business unit drives digital in a decentralized and isolated fashion

Chapter 5

Analysis

In this chapter, empirics from the case study are comparatively analyzed. The comparative analysis begins with an overview of the digital context, and key similarities and differences between the case companies. This prepares the reader for the subsequent sub-chapters that explore the research questions. The comparative analysis follows the structure of the Exploring Digital Framework.

5.1 Digital Context

Becoming more digital is a high priority for both companies, but their strategic posture and approach for digital transformation differ significantly. The most apparent and critical difference between the two, is that Company A has an explicit and deliberate digital strategy while Company B does not have a digital strategy at all. Not having a digital strategy generally results in a lack of guiding direction, which in turn causes scattered and misaligned transformational efforts. Such issues seem more tangible for Company B than for Company A, and Company B's absent digital strategy is likely a contributing factor.

Looking at how academia discusses digital strategy, or strategy in general, there is traditionally an underlying emphasis on strategy being an interactive top-down procedure. This comes as an inevitable implication of the common hierarchical decision-structure of organizations. Direction is to be set and provided by top management and thereafter communicated effectively downstream. With Company B not having a digital strategy, this strategic procedure is non-existent. Company B's top management only communicates "digitalize more", resulting in a top-down proceeding that tumbles and a strategic posture that crumbles. From a contextual standpoint, this ownership and governance issue is certainly problematic for Company B.

As Company A has a deliberate digital strategy, it could be easy to assume that Company A is digitally superior. That is however not necessarily the case. It is not only about having a digital strategy, it is also about having *the right* digital strategy that is suitably deliberate or emergent. By viewing a strategy as a navigational tool, it is obvious that a navigational tool that guides you in the wrong direction is not an adequate navigational tool. A greatly flawed navigational tool could be equated with not having a navigational tool at all, since disorientation would be the outcome regardless. An inadequate deliberate digital strategy could cause delusional

security of navigational effectiveness, while a non-existent or emergent digital strategy could cause a more self-aware disorientated situation. Nevertheless, disorientation and difficulties in setting digital priorities are evident. This seems to be the case for Company A and B, respectively. To exemplify, Company A seems to be lacking emphasis on digitally enhancing customer engagement, and there is a slight discrepancy between the digital vision and digital initiatives in this area. Opting for a purely deliberate digital strategy in a business environment that is not completely predictable or controllable in terms of digital development is complicated, or perhaps even impossible. On the other side of the spectrum, Company B admits to "developing and executing the digital strategy simultaneously", which clearly goes against the nature of traditional and deliberate strategy. This statement hints slight tendencies of an emergent digital strategy, but it is not to forget that Company B explicitly is lacking a digital strategy. Again, an absent digital strategy cannot be an emergent digital strategy. As much as Company B seems aware of this problematic situation, disorientation and difficulties in setting digital priorities are still evident. Effective digital strategy is likely neither purely deliberate nor perfectly emergent, as the sole complexity of digitalization and digital disruption surely requires guidance by both visions and actions. That is, digital strategy could benefit from both deliberate tendencies such as structure, and emergent tendencies such as flexibility, simultaneously.

Having digital as a high priority does not equal that the right digital priorities are set, but only the ambition to do so. Nevertheless, having a digital strategy, deliberate or emergent, would probably substantiate digital as a high priority, and signalize its level of priority when communicated downstream. It would therefore always be better to have a digital strategy than to not have a digital strategy.

Digital disorientation, wherever it derives from, seems to compel the case companies into rushing digital initiatives. Transformational initiatives in general are widely known to have low success rates in terms of creating the expected value, and rushing such initiatives could certainly worsen this success rate further. A factor that aggravates this situation, is to not have a clear picture of where competitors are and what they are doing in terms of digital. Neither Company A nor B give decisive answers on if they are leading, following or lagging in terms of digital presence relative their industry. This could partially explain rushed digital initiatives, as being unknowing leads to uncertainty, which in turn leads to fear and digital impatience. Wrongfully worrying about that everyone else is outperforming you by making significant digital advancement does not contribute to deliberate decisions. Thus, not being aware of your digital business environment could cause further digital disorientation and compel you into unnecessarily rushing of digital initiatives. This strengthens the premise of this master thesis:

> *From a business standpoint, being afraid, skeptical, confused and digitally paralyzed is not an option.*

In terms of the issue highlighted by this premise, Company B seems more self-aware. This self-awareness certainly derives from that Company B has conducted digital assessments and digital benchmarking. Such activities do not only contribute to better knowledge of your relative digital state, but simultaneously mitigate the problem of becoming either digitally impatient or digitally paralyzed.

From a business standpoint, becoming digital is a delicate balance of various aspects. Both case companies highlight that all major market players, including themselves, have digital strengths and weaknesses. Intuitively, this seems reasonable. None of the two case companies could give a decisive answer on what the right amount if digital is. That is, where techquilibrium is. Finding just the right amount of digital to power the business model needed to compete most effectively

as the business environment continuously makes digital advancements is difficult. Techquilibrium sounds fantastic and intuitive in theory but appears to be complex to achieve in practice. Looking at how the case companies struggle to balance digital efforts, the struggle does not solely derive from the complexity of knowing to what extent one should engage in digital technologies and concepts. Balancing digital, and striving for techquilibrium, is two-dimensional rather than one-dimensional as implied by the definition. The first dimension is, as implied by the formal definition, to balance the mix of traditional and digital capabilities and assets to power the business model needed to compete effectively. In addition to this, there is also the dimension of pace. That is, to balance the pace of not being digitally paralyzed or digitally impatient. Techquilibrium is obviously something to strive for, but should be seen as an everchanging target that requires the right mix and pace. That is, the mix and pace cannot be constant over time. Thus, aiming for techquilibrium requires continuous re-evaluation of digital efforts.

All in all, both companies seem digitally ambitious and digitally disoriented, simultaneously. It is not necessarily that these companies are lacking either strategic or transformational performance relative to other Swedish manufacturing companies. Digital is difficult, and as discussed by Furr & Shipilov (2019), it is evident that top level executives struggle to set the right digital priorities no matter if a digital strategy is in place or not. With that said, these contextual outcomes could be classified as expected rather than surprising.

With the digital context established, an overview of key similarities and differences between the case companies are given to facilitate reading the proceeding comparative analysis. This overview is found on the next page, in Table 9.

Table 9:
The Exploring Digital Framework – an overview of key similarities and differences between the case companies

	Digital state Where are we now in terms of digital development?	**Digital vision** What are our digital priorities?	**Digital initiatives** What are we doing to approach our digital vision?	**Digital drivers** What and who are driving our digital transformation?	**Digital challenges** What are the resistances, trade-offs and dilemmas?
Value proposition Reshape value	▪ Both companies mainly have physical products ▪ Neither Company A nor B have digital service offerings in place ▪ The value lies in the hardware for both companies	▪ Both companies opt for connectivity and traceability ▪ Servitization is a high priority for both companies ▪ Both companies highlight that servitization requires reinvention of business model ▪ Company A has a more detailed digital vision than Company B	▪ Both companies have technological confidence, but lack initiatives that explore business aspects of digital ▪ Company A develops a PaaS solution, Company B establishes QR code technology that in turn will enable a service platform	▪ Company A has a CDO as digital driver, Company B has allocated this responsibility to business unit level ▪ Both companies have similar emphasis on what drives digital: increased revenue, new business opportunities and core values	▪ Both companies have similar emphasis on digital challenges: change management and business model reinvention ▪ Company B finds realizing business opportunities more challenging than Company A ▪ Digital debt is more apparent for Company B
Infrastructure & processes Transform value creation	▪ Company A has a digital strategy, Company B does not ▪ Company A has an organizational structure, clear ownership and governance that supports digital transformation, Company B does not ▪ Company B uses digital assessments and benchmarking, Company A does not ▪ This has been a primary focus area for Company A	▪ This area is receiving growing attention from both companies ▪ Smart manufacturing and industry 4.0 are high priorities for both companies ▪ Ownership, supporting organizational structure and governance are high priorities for Company B, while Company A already has these in place. That is, Company A has a more deliberate strategic posture	▪ Company B conducts small scale testing of smart manufacturing solutions, Company A claims fully developed industry 4.0 ▪ Company A has a well-developed operational backbone, Company B is in initial stage of developing one ▪ Company A has external focus on new digital talent, Company B has internal focus on upskilling and reskilling ▪ Company A has defined ownership, Company B creates ad hoc groupings ▪ Company B emphasizes partnerships and digital ecosystems to a greater extent	▪ Company A has a CDO as digital driver, Company B has allocated this responsibility to business unit level ▪ Both companies have similar emphasis on what drives digital: efficiency gains and leaner operations	▪ Both companies have similar emphasis on digital challenges: strategic and cross-functional alignment and focusing of efforts ▪ These challenges are more apparent for Company B, who does not have a digital strategy, ownership or governance
Customer engagement Enhance value deliverance	▪ This has been a primary focus area for Company B ▪ Company A has neglected this area as of now	▪ Company B is redirecting focus away from this area, while Company A already has this as a low priority ▪ Company B has a more detailed digital vision than Company A	▪ As Company A neglects this area, Company B is taking various initiatives: exploring aftermarket potential, familiarizing own organization and customers with servitization, investigating business model implications	▪ Company A has a CDO as digital driver, Company B has allocated this responsibility to business unit level ▪ Both companies have similar emphasis on what drives digital: customer expectations and competitive aspects	▪ Both companies have similar emphasis on digital challenges: grasping and meeting customer expectations ▪ Company A, who opts for spillover effects, struggles with realizing this spillover effect

5.2 Digital State

Value proposition

Both case companies emphasize that their value proposition primarily consists of their physical products with negligible digital features. There are no substantial digital service offerings in place. The reason for this is likely the rooted characteristics of their respective industry as well as the inherent aspects of their products. As the main business revolves around the physical products, these are core for large and traditional manufacturing companies. Thus, the digital state of the value proposition is intuitively low. There is a feeling of digital debt in regards of the value proposition, and that feeling is probably true to a certain degree.

Infrastructure & processes

A noticeable discrepancy between the case companies is their way of reflecting over the digital state. Company B has conducted digital assessments and benchmarks, thus establishing an objective overview of the true digital state. These digital assessments and benchmarks show a weak digital state. An objective overview of the digital state seems to entail higher self-awareness, which is made evident as Company B deems itself as a digital follower at best.

Looking at Company A, no pronounced digital assessments or benchmarks has been conducted. At the same time, Company A is a self-proclaimed digital leader. Whether Company A is a digital leader, or if this self-proclaimed digital state is an act of lacking self-awareness could be further questioned. What is certain is that establishing a way forward intuitively becomes even more complex if you do not have an accurate and objective overview of the current digital state. Not knowing where you stand today makes planning for the future more difficult. Thereof, digital assessments and benchmarks are key, as a lack of such activities could cause further digital disorientation.

With that said, Company B would have all prerequisites for building a successful digital strategy in theory, meanwhile Company A would not. However, it is Company A that has an explicit digital strategy and Company B that has not. In addition to this, it is Company A that has an organizational structure and governance model that supports digital transformation while Company B has not. A reason for these contradictions is likely that companies find it difficult to determine what should be done in what order. For example, Company B mentions being in "digital debt" and having "to push for numerous digital initiatives all at the same time". This insight showcases how large manufacturing companies struggle in their digital journeys. Larger companies generally have slower decision-making processes than smaller companies, and as digitalization could be rapid and discontinuous, they have problems to keep up.

When taking a more detailed look at the digital state of the infrastructure and processes, it is evident that the manufacturing processes has received most attention. This is not surprising as manufacturing processes are core for manufacturing companies. For example, Company A claims to have an industry 4.0 environment in place, and Company B is at a conceptual stage of smart manufacturing. Both companies have digitally mature manufacturing processes in sight.

Company B made an interesting distinction, which is to not confuse automation with digitalization. This is probably a question of how you define digitalization, as some would argue that automation in some instances certainly is equivalent to digitalization. Nevertheless, both companies have sophisticated but conventional supply chains and supporting internal processes, which are automated but not necessarily digitalized, according to themselves. There are

however hints that this is a conscious choice, as both companies do not see a need for further enhancing the digital state of these aspects. Again, techquilibrium is not about being fully digital in all areas, but rather to find the right mix between traditional and digital.

All in all, the digital state of the infrastructure and processes is ambitious regarding manufacturing processes but less so for the supply chain and supporting internal processes. A major discrepancy is how the organizations structure themselves and governs digital transformation. Company A are clearly ahead of Company B in these structural aspects.

Customer engagement
This is the most discrepant sub-dimension between the two case companies. For Company A, digitally enhancing customer engagement is explicitly not a main focus. On the other side of the spectrum, Company B has put substantial effort into incorporating digital technologies and concepts to enhance value deliverance.

Company B is digital up until and including the purchase, after which the digital customer experience declines. Customers of Company B can use a digital product configurator prior and during purchases, and there are QR codes on products that allow for a digital and continuous interaction between Company B and its customers. Company A does not have any equivalent means of digital customer engagement.

The reason for this discrepancy is likely the difference in focus between the case companies. Company A has been focusing on building the operational backbone and fulfilling prerequisites for a digital service platform. Moving forward, Company A aims to "do more of what is already being done". Company B has been focusing its efforts on front office, resulting in a customer engagement with stronger digital presence relative to Company A. Company B did however recently shift focus from "back-end to front-end", due to the realization that "the back-end fundamentals must be in place before enjoying the front-end benefits". This realization provides consensus, as both Company A and B now focuses efforts on the enabling infrastructure and fulfillment of prerequisites for servitization rather than trying to enjoy non-substantiated front office benefits. This is certainly wise, and a sign of that the right digital priorities are being made.

The digital state of customer engagement is ambiguous and seems to be strongly attached to whether this area has been an initial focus area or not. The two case companies are on different ends of the spectrum, Company A with sophisticated but conventional customer engagement, and Company B with a digital customer experience up until and including the purchase. No matter the digital state, there seems to be exist consensus on redirecting focus away from this area and towards the value proposition, infrastructure and processes.

5.3 Digital Vision

Value proposition
With similar digital states of the value propositions, both case companies also seem to share harmonized digital visions. Company A and B highlight that there are visions of making their products digitally active through connectivity, and digitally traceable through traceability. Company B is clearly prioritizing connectivity as this is the common denominator for one of the company's two central groupings for digital transformation.

Both connectivity and traceability are key building blocks for a future digital service offering and servitization. Company A does seem to have a more detailed vision of how the value

proposition could be servitized through a platform as a service solution. Company B on the other hand has a less detailed vision of how its digitally servitized value proposition will take form, but provides some ideas of extended QR code features and digital twins. A reason for the difference in detail could be that Company A has an explicit digital strategy while Company B has not. A digital strategy could certainly act as guidance when making business out of technological digital advancements.

Both companies are perceived as self-confident in their technological ability to achieve this vision. Instead, the uncertainty lies in the business aspects. Company B mentions that "it is not only about connecting your products, it is also about making use of this connectivity from a business perspective", which aligns with the company's lack of a detailed digital vision of a servitized value proposition. Company A has a more detailed vision and emphasizes that "new digital services aim to reveal new digital revenue streams from both current and new customers". Both companies realize that a digitally extended value proposition through servitization requires a revamp, or even a reinvention, of the business model. Company A has a more detailed plan than Company B, but complete clarity does not exist. There is a vision that a revamp or reinvention will take place, but no concrete ideas of what it would look like. To conclude, it is critical to realize that the digital vision should not be to move away from making world class products, but rather to complement the products by placing a digital service offering on top.

Infrastructure & processes

The difference in approach and focus makes itself visible in the digital vision of the infrastructure and processes. Company A wants to "do more of what is already being done", which implies focusing on infrastructure and processes. Company B has recently redirected its focus from customer engagement towards infrastructure and processes. A shift in focus could be necessary, but it simultaneously signalizes that the initial focus was not right. A reason for this shift could be that Company B lacks a digital strategy. Having a digital strategy in place facilitates focus and prioritization. Furthermore, it seems to exist consensus that building the operational backbone should be a primary prioritization. That is, to harmonize the data architecture, create seamless and transparent transaction processing and standardize back office shared services (Sebastian et al, 2017).

Company A emphasizes that all "digital fundamentals" are in place as a result of having focused on building a digital operational backbone for a long time. While Company A focuses on establishing new data centers to further strengthen the digital operational backbone, Company B has just started to focus on this area. Company B highlights that "everything is data-driven, and we do not have our data set-up perfectly in place yet", which hints that less progress has been made in this area in comparison to Company A. Company B also mentions "digital debt" regarding its value proposition, but this is likely to be true for the infrastructure and processes as well. Such digital debt could partially be explained by faulty focus and suboptimal prioritizations, which ultimately results in that much must be done at the same time to mitigate the risk of digital disruption.

There is also a mutual emphasis on building a strong and flexible operational backbone that allows for "plug-in-and-play" compatibility. This represents a way to prepare for future digital development and to mitigate the risk of being digitally disrupted. Interestingly, this alludes to Skog et al's (2018) statement that "digital disruption is generally perceived from the perspective of firms that are heavily invested in old conditions and whose typical or planned course of development is interrupted". Furthermore, both companies are aiming for lean operations, and see digital as a tool to become leaner.

Despite having significantly different ways of structuring and governing digital transformation, the digital vision of this area is harmonized. Company A has a central organization in place, and Company B has a vision to have "a central organization in place to ensure alignment of digital efforts". Yet again, Company A is ahead of Company B in terms of these structural aspects and an explicit and deliberate digital strategy is probably the reason. There is an interdependence between the digital strategy and the operational backbone. It seems that a deliberate digital strategy sheds clarity on how to structure the organization and govern digital transformation. Simultaneously, without an operational backbone the digital strategy cannot be executed and new business opportunities cannot be exploited.

As the two companies operates in different industries, they are likely to face slightly different industry characteristics which in turn require slightly different approaches. It could be that the business environment of Company B implies that partnerships and digital ecosystems must be pursued, while Company A could make digital advancement on its own. It could also be that Company B has identified a situation in which the company is unable to attract needed resources, such as digital talent, on its own and must rely on partnerships instead.

Lastly, it seems that supporting internal processes are subjects for automation rather than digitalization. Company B emphasizes the that one should "not get automation and digitalization confused". Both companies have highly automated processes, but there are no concrete ideas on how to digitally enhance them. Again, this is likely a question of how digitalization is defined. Automation of supporting internal processes could certainly be classified as a mean of becoming more digital. Irrespective of how digitalization is defined, automation could rarely be seen a mean of becoming less digital.

Customer engagement

Company A seems to have a clear idea of in what order these areas should be prioritized. Firstly, focus was on building a digital operational backbone. Now, primary focus is on building a digital service platform. Customer engagement is not prioritized as of now, signalizing that this area should be prioritized only after the other two are developed. Company A does however hint that there is a long-term digital vision of digitally enhanced customer engagement, which in turn signalizes a certain degree of maturity of the infrastructure and processes, and soon also the value proposition.

Company B on the other hand does not manage to redirect its focus away from this area. There is still an ambitious digital vision for customer engagement for Company B. A reason for this could be the ad hoc company-wide grouping for online sales, which implies a commitment towards making digital advancements in this area. While the focus was meant to be redirected, the company-wide grouping for online sales is still in the spotlight. Company B's intentions and actions are misaligned, probably because of lacking governance and top-down directives.

Servitization of the value proposition and tapping the aftermarket business potential are recurring visions. Such visions are based on bidirectional sharing of data, which is turn is generated by connectivity solutions or end user behavior analysis. It seems that the digital visions of the value proposition and customer engagement overlap, implying a spillover effect. The value proposition and customer engagement seem partially entangled, much like Company A implies. However, products and services does not sell themselves. Digital advancements in customer engagement should not be undermined, but lucratively prioritizing such require an enabling operational backbone and a digital service platform.

5.4 Digital Initiatives

Value proposition

The digital initiatives taken for each of the two case companies correspond well with their respective digital vision. However, the companies are in different stages of digital development. While Company A focuses on developing a digital service platform solution, Company B is in a conceptual stage of connectivity. Company B's scattered digital focus has resulted in less progress in relevant areas, at least in comparison to Company A. Another reason for Company A being ahead could be that digital initiatives are multi-prioritized, leading to faster progress.

In accordance with the reasoning for the digital vision, both companies are self-confident in pursuing technological initiatives but less so in pursuing the corresponding business initiatives. Manufacturing companies revolve around technology and mechanical expertise. Therefore, it is not surprising that initiatives in close perimeter to the core expertise are prioritized. Becoming digital often means exploring business opportunities outside of the current comfort zone, which intuitively could impose organizational resistances.

Infrastructure & processes

The digital initiatives for the infrastructure and processes follow the digital visions of the case companies. Digital initiatives seem to revolve around manufacturing processes and governance, with emphasis on starting small and scaling up. Company A are a couple of steps ahead of Company B. Company B focuses on establishing systems support and IT infrastructure for smart manufacturing. Company A is more forward-looking and is establishing new datacenters and works with initiatives to strengthen the approach of attracting digital talent.

There is a critical difference between the case companies' recent digital initiatives. Company A's CIO recently shouldered CDO responsibilities to clarify the ownership of digital transformation. Company B does not have a centralized ownership. Instead, Company B's ownership of digital transformation is decentralized to business unit level, resulting in ad hoc company-wide groupings. This does not seem to be a conscious choice, but rather a result of lacking priority from top management. If digital transformation is a high priority, as both companies imply it is, ownership intuitively becomes a critical and a prestigious task to solve. Recent digital initiatives reveal that Company A truly has digital as a high priority. The opposite could be said about Company B's line of action.

Furthermore, Company B is more about upskilling and reskilling to internally build digital skill sets, while Company A is more about acquiring new digital talent. Both companies use both approaches, but there are however tendencies of a more internal respectively external focus. To handle digital, an active and balanced engagement in both approaches should be considered, perhaps with the help of partnerships and digital ecosystems.

Customer engagement

The digital initiatives for customer engagement are aligned with the respective digital visions. With that said, the digital initiatives are aligned with the digital visions in all areas for both companies. Whether this is objectively true, or if the digital visions are extrapolations of the current digital initiatives, could be further questioned. This skepticism is especially directed towards Company B. Company B does not have an explicit digital strategy, and alignment of the digital vision and digital initiatives is therefore surprising. That is, it is surprising to see alignment of actions with a complete absent of intention about it.

Company A is not taking any significant initiatives in this area as of now, but simultaneously believes in a positive spillover effect from other digital initiatives. Again, products and services do not sell themselves. Not taking any initiatives cannot sustain long-term digital business prosperity. As much as the spillover effect sounds reasonable, it seems rather drastic to not take any initiatives at all.

Company B are more active, which is not surprising since customer engagement has been an area of focus for Company B for a long time. As discussed earlier, both companies are uncertain of how digital could impact business. Company B is addressing this issue, and is starting to investigate business model implications. Perhaps getting closer to the customer, which is key according to Company B, has revealed the business impact of digital transformation to a greater extent. Intuitively, business model deficiencies become more tangible as focus is directed closer to the customer side. Business model implications should be investigated, but Company B may be getting ahead of itself. The operational backbone and a digital service platform should be the primary focus. However, initiatives of investigating business model implications could certainly run in parallel.

5.5 Digital Drivers

Value proposition

Both case companies highlight the business case as a key digital driver. The business case primarily has two sides: (1) cost savings and (2) increased revenue. This enables three business case situations for digital initiatives. Firstly, a digital initiative could be driven directly by cost savings, or indirectly by efficiency gains that will result in cost savings. Secondly, a digital initiative could be driven by increased revenue. Thirdly, a digital initiative could be driven by both cost savings and increased revenue.

The case companies highlight efficiency gains as a digital driver for the value proposition. At first sight, this strikes as rather strange, as extending the value proposition hardly could result in efficiency gains. To invoke efficiency gains as a driver for transformational initiatives is likely in the DNA of a manufacturing company with a lean operating model. In this case, it could perhaps be something to fall back on when you are uncertain of why digital initiatives are pursued. Thus, “becoming more efficient” is just an exquisite way of saying “becoming better”, which in turn is a hollow statement.

After getting efficiency gains out of the system, the emphasis shifts towards the other side of the business case. Intuitively, increased revenue is achieved by either selling higher volumes or charging customer more. Regardless of which, it is key to meet customer expectations. New customer expectation could also reveal new business opportunities, which in turn give opportunity for business model innovation. Altogether, this is likely to result in differentiation and a competitive advantage. All these drivers are highlighted by both case companies, and this chain of digital drivers make sense. Digital drivers could be sequential and entangled.

Both companies highlight traditional core values, such as safety, functionality, and quality as digital drivers. Digital seems to be a way to strengthen core values. Or in other words, core values seem to drive digital. Furthermore, both case companies emphasize that their products are “lumps of metal”, which implies that the electronic deliverability is likely to be low. Instead, digitally reshaping the value proposition is about placing a service offering on top of the physical products. Here, aspects such as customizability comes into play. Although Company B does not explicitly mention customizability as a digital driver, it is obvious that such aspects

are driving digital. For example, Company B has recently developed a digital product configurator and emphasizes the importance of accurate and timely product information that takes customization into account.

Infrastructure & processes

Efficiency gains are mentioned as a digital driver for the infrastructure and processes as well, which in this case makes sense. Infrastructure and processes generally thrive of standardization, and efficiency improvements of core processes, such as manufacturing, would intuitively result in cost savings. This reasoning is further strengthened as Company B emphasizes "all manufacturing KPIs" as digital drivers. Thus, increased operational efficiency through standardization is likely a true digital driver. As manufacturing companies have manufacturing as a core process, there is a prestige in having sophisticated and reliable production facilities. This is also a customer expectation. Consequently, process reliability and customer expectations go hand-in-hand with opting for operational excellence.

Moreover, Sebastian et al (2017) highlight that "an operational backbone enables operational excellence" and that an operational backbone enables current and future business proceedings. This is certainly a source of digital drivers. For example, Company B highlights that adequate infrastructure and processes are a prerequisite for front office benefits. Without a certain digital maturity of the operational backbone, the current business model cannot effectively be powered. Additionally, a lacking operational backbone does not allow for capturing new business opportunities or smooth introduction of new digital technologies, concepts, products and services. Thus, an operational backbone must be in place to power the current business model and allow for capturing of new business opportunities and enable business model reinvention. Go-to-market and speed-to-market aspects that Company A mentions as digital drivers for the value proposition are therefore more likely to be drivers for the infrastructure and processes. Altogether, these aspects enable companies to be prepared for the future, which is key in a business environment of growing competition.

There is a clear discrepancy of who is driving digital in Company A and B, respectively. Company A has made a conscious choice of ownership of digital transformation with the CIO shouldering CDO responsibilities. Meanwhile, Company B has made an unconscious choice of allocating responsibility in a decentralized fashion to business unit level. Having a clear and consciously chosen digital driver, either an individual or a team, seems to have a positive influence on digital transformation. This is closely related to the CSF of having defined roles and responsibilities, which is key for all transformational efforts. This cannot be achieved by neglecting the question of ownership.

All beneficial outcomes of becoming digital does not necessarily drive digital. A prime example of this is how Company B mentions employee safety and better working environment as digital drivers. These are more likely to be beneficial consequences rather than true drivers, as the working environment and employee safety of large Swedish manufacturing companies are already considered adequate.

Customer engagement

Looking at the business case again, we had digitally reshaping the value proposition primarily being driven by increased revenue and digitally transforming infrastructure and processes primarily being driven by efficiency gains and cost savings. Customer engagement seems to represent the third business case scenario, in which both increased revenue and cost saving are digital drivers.

By making the right digital advancements in customer engagement, the administrative burden plummets and ease of doing business skyrockets for customers. Customers could also be more willing to do business with a company that has a more innovative image. Altogether, resulting in an incentive of increased revenue for companies. Becoming more digital could also make the customer more independent and reduce cost to serve, which is especially emphasized by Company B. Thus, digital advancements in customer engagement are driven by both cost savings and increased revenue. That is, both sides of the business case.

As highlighted by both companies, customer expectations seem to be a main driver for digital advancements in customer engagement. However, Company A believes that all customer expectations are met. Whether this is true, or just an overbold statement deriving from lacking insights is to be further discussed as a digital challenge. Nevertheless, digital advancements in this area are surely driven by customer expectations, but also by the will of achieving an innovative image. Digital is trending as of now. Wanting to show high maturity of digital capabilities must therefore also drive digital advancements in customer interaction. Meeting customer expectations regarding customer interaction could result in an innovative image. In turn, a competitive advantage could be realized, which becomes even more important in a business environment of growing competition.

5.6 Digital Challenges

For digital challenges, it is essential to make a distinction of whether they are accompanying the digital strategy or the digital transformation. That is, whether they correspond to *setting* the direction or *carrying through actions* in the set direction.

Value proposition
Regarding challenges of digital strategy for the value proposition, Company B coined the insightful term of being in "digital debt". In the context of this master thesis, digital debt means that

> *digital advancements have been lacking in the recent past, resulting in that much must be done at the same time in the present or near future to mitigate the risk of digital disruption.*

The concept of digital debt is a valuable contribution to how digitalization and digital disruption was illustrated in Figure 3. As visualized in Figure 4, digital debt could be described as the distance between a company's digital state and the digital development of its business environment. With the same reasoning, a digital surplus could occur if a company overshoots the trend of digitalization. In the context of this master thesis, a digital surplus means that

> *digital advancements have been excessive in the recent past, resulting in an excess of digital capabilities and assets that could either give a competitive edge or, if unexploited, lead to inefficiencies.*

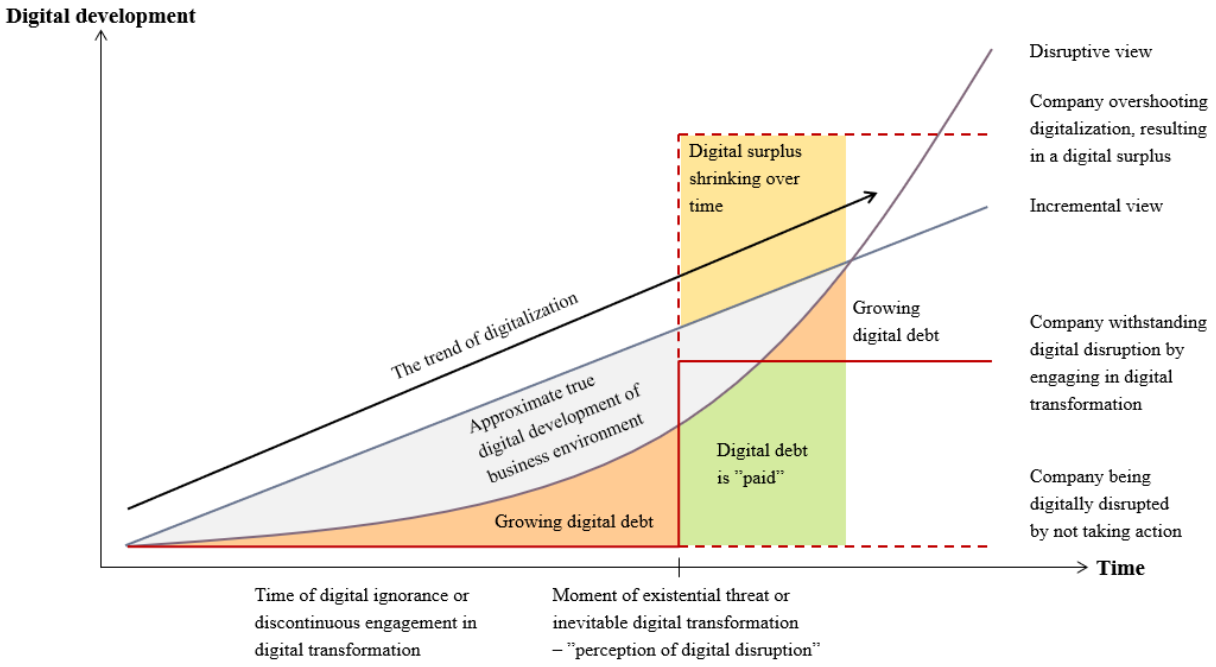

Figure 4:
A visualization of the concepts of digital debt and digital surplus in the context of digitalization

Digital debt and digital surplus also connect to techquilibrium. Being in digital debt is a result of a lacking pace of digital advancement and would result in capabilities and assets skewed towards the traditional side of the spectrum. However, if a company is upping the pace too much, a digital surplus could occur. A digital surplus would be represented by capabilities and assets skewed towards the digital side of the spectrum. Theoretically, both digital debt and digital surplus could be sub-optimal. Again, techquilibrium is about pacing to find the right mix of traditional and digital capabilities and assets to power the business model needed to compete most effectively. Avoiding and getting out of digital debt is a true digital challenge, not only for the value proposition but for all areas of business. Avoiding a digital surplus is not as critical, and getting out of it happens automatically as the digitalization trend will catch up over time. If a company can exploit this digital surplus it could result in a competitive edge. In such a situation, the digital surplus is not necessarily an excess. However, if the company is unable to exploit the digital surplus, it will solely be a token of excessive and unnecessary digital transformation. In such situations, having a digital surplus would only lead to inefficiencies.

Another digital challenge regarding digital strategy for the value proposition is to balance technology and business aspects. Both case companies highlight the struggle of backing up technological advancement with business fundamentals. This make sense, since manufacturing companies have prestigious technological track records, meanwhile servitization of the business model is perceived as unfamiliar, uncomfortable, and even intimidating. This is certainly a true digital challenge. Consequently, the case companies experience difficulties in realizing and capturing digital business opportunities. These challenges are likely true for all areas of business.

Looking at challenges regarding digital transformation, it primarily comes down to the traditional change management issues, just as Näslund (2014) highlights. For example, the case companies mention overcoming prestige anchored in the organizational culture and ensuring cross-functional alignment. All change management aspects are therefore considered as digital challenges.

Infrastructure & processes

As discussed previously, Company A has a digital strategy, defined ownership and a governance model, while Company B is missing all these aspects. Nevertheless, both case companies struggle to focus digital efforts, achieve consensus, set near-term priorities and not rush digital initiatives. However, it is evident that these problems are affecting Company B to a larger extent. This is likely due to these lacking aspects.

A key digital challenge of digital strategy is to build one. Then, someone needs to shoulder ownership and ensure proper execution of this digital strategy. Finding the right ownership structure, organizational structure and governance model is challenging. Lacking in the areas of digital strategy, ownership, organizational structure and governance consequently impose challenges of

- Focusing efforts
- Setting near-term priorities
- Digital impatience and rushing digital initiatives
- Avoiding digital debt
- Achieving techquilibrium
- Strategic alignment and consensus
- Cross-functional alignment

The processes of getting the organization onboard on digital change seem to be influenced by the approach for allocation of responsibility for building and executing the digital strategy. For Company A, the difficulty lies in achieving support downstream. In this case, the main challenges are not related to digital strategy, but rather to digital transformation. For Company B, the difficulty derives from a lack of distinctiveness from top management, or in particular to find common ground and establish aligned directives. In this case, the main challenges are related to both digital strategy and digital transformation. This likely explains the frustration Company B has towards top management, and the lack of trust in the organization's capabilities. If clear ownership is in place, getting the organization onboard on digital change becomes a downstream process. Otherwise, it becomes an upstream process in which the digitally willing organization must persuade top management. Building and executing a digital strategy should be an interactive top-down process, with clear directives communicated downstream from top management.

Given that digital strategy, ownership, organizational structure and governance are in place, it could still be difficult to realize and prove benefits and business cases for digital concepts. Both case companies hint that there is a strong will of becoming digital, but that it is sometimes difficult to motivate engagement in digital initiatives. A reason could be that digital initiatives rely on novel technologies and concepts that are not yet widespread and tested to the same degree as traditional technologies and concepts. Thus, benefits and business cases are more difficult to realize. This induces an increased sense of uncertainty towards digital initiatives, resulting in lacking digital pace or digital paralysis. Consequently, this could explain the difficulty of ensuring investments that Company B experiences. This becomes troublesome as an operational backbone that supports both current and future business proceedings requires continuous improvements and extensions, and thereby also investments.

Concludingly, the challenges of digital transformation for the infrastructure and processes come down to traditional change management. In addition to traditional change management, the case companies mention balancing new digital talent with existing expertise. Due to the characteristics of digitalization, organizations must continuously improve digital skill sets and knowledge. Thus, acquiring new digital talent is a must, and incorporating it into the current knowledge base is surely a challenging balancing task. Meanwhile missing competencies are described as a digital driver by academia, it is rather perceived as a digital challenge by the case companies. Perhaps, missing competencies could instead result in network effects. Companies that fail to attract digital talent themselves could rely on partnerships and digital ecosystems.

Customer engagement

As much as customer expectations are driving the case companies toward digital advancements, they also impose challenges. It is not only challenging to meet customer expectations, but also to realize and grasp them. Intuitively, it is nearly impossible to meet customer expectation if you do not grasp them.

That Company A believes all customer expectations are met is likely an effect of flawed or insufficient focus on customer engagement. This could further explain Company A's difficulties in achieving the positive spillover effects from digital efforts in other areas of business. As customer expectations are valuable input for the direction of digital development, neglecting this input could result in strategic deficiencies. Company B, who has been focusing on customer engagement, seems to have realized this. However, Company B lacks a digital strategy and proper governance, which results in difficulties in exploiting knowledge of customer expectations. An example of such an insight is that Company B knows that customers are not necessarily tech savvies, and that the human characteristics of business is appreciated by customers. Whether Company B can effectively exploit this insight on a company-wide level remains to be seen.

Servitization is enabled by the operational backbone, but seems to take place in the borderline between the value proposition and customer engagement. This implies that revamping and reinventing the business model also impose challenges for customer engagement. Both companies and customers must familiarize themselves with new digital technologies and concepts, as well as a servitized business model. Customers must be made susceptible to servitization, which also includes being comfortable with bidirectional sharing of data. In this sense, companies face both traditional change management challenges and challenges of customer susceptibility simultaneously. This requires a change in mindset, for both companies and customers.

Table 10:
The Exploring Digital Framework – an overview of the comparative analysis

	Digital state Where are we now in terms of digital development?	**Digital vision** What are our digital priorities?	**Digital initiatives** What are we doing to approach our digital vision?	**Digital drivers** What and who are driving our digital transformation?	**Digital challenges** What are the resistances, trade-offs and dilemmas?
Value proposition Reshape value	▪ Mainly physical products ▪ The value lies in the hardware ▪ Industry characteristics and core business revolves around physical products ▪ Digital state of value proposition intuitively low ▪ Digital debt	▪ Connectivity and traceability enable servitization ▪ Servitization requires necessary and difficult business model revamp or reinvention ▪ A digital strategy provides guidance for business model revamp or reinvention	▪ Aligned with digital vision ▪ Technological initiatives in different phases but in same direction ▪ Ensure viable connectivity solution, then develop digital service platform ▪ Lack of initiatives that explore business aspects	▪ Efficiency gains is a hollow statement to fall back on ▪ Digital as a strengthener of core values, and core values drive digital ▪ True drivers are new and increased revenue through new business opportunities, leading to competitive adv.	▪ Digital debt – much must be done at the same time ▪ Backing up technological advancement with business fundamentals ▪ Servitization of business model ▪ Traditional change management
Infrastructure & processes Transform value creation	▪ Lack of digital assessments and benchmarks cause further digital disorientation ▪ Discrepant structural aspects ▪ Operational backbone and prerequisites for a digital service platform are receiving growing attention	▪ A digital strategy facilitates focus and prioritization ▪ The operational backbone should be a top priority as it enables creation and delivery of a digital value proposition ▪ Manufacturing processes are core and receive growing attention with Industry 4.0 and smart manufacturing ▪ Digital for leaner operations ▪ Preparation for the future ▪ Sometimes automation is good enough, and sometimes automation is digitalization ▪ Ownership, structure, and governance are critical success factors	▪ Aligned with digital vision ▪ Small scale testing and scaling up ▪ Manufacturing processes and governance are in focus ▪ Digital operational backbone is prioritized, but progress differs between companies ▪ Ad hoc groupings inferior to conscious central ownership ▪ Establishing ownership signalizes high priority - CDO is the go-to solution ▪ Active and balance engagement in skill building and talent acquisition	▪ Who drives digital varies, but having a clear driver seems to have positive influence on digital transformation ▪ Efficiency gains in core processes and main cost driving processes are true digital drivers ▪ Operational backbone powers current business model and enables capturing of new business opportunities, thus receiving growing attention ▪ Do not confuse beneficial outcomes with true digital drivers	▪ Building a digital strategy ▪ Establish effective structure, ownership, and governance ▪ Ownership influences the process of getting organization onboard on digital change ▪ Operational backbone requires continuous investments ▪ Proving benefits and business case of digital concepts ▪ Balance new digital talent with existing expertise ▪ Missing competencies are more challenging than driving ▪ Traditional change management
Customer engagement Enhance value deliverance	▪ Discrepant focus between front and back office results in ambiguous digital state of customer engagement ▪ Digital state ranges from non-existent to substantial ▪ Focus has been redirected away from this area	▪ Servitization and aftermarket business potential ▪ Value proposition and customer engagement entangled – spillover effect ▪ Enabled by operational backbone and digital service platform	▪ Aligned with digital vision ▪ Business model implications are investigated, but should not be primary focus at current digital state ▪ Hoping for spillover effects does not motivate lack of initiatives	▪ Both cost savings and increased revenue are digital drivers ▪ Customer engagement is a main digital driver ▪ As digital is trending, digital is a competitional aspect	▪ Grasping and meeting customer expectations ▪ Becoming digital without losing human feel of business ▪ Familiarize own organization and customers with servitization ▪ Traditional change management

Chapter 6

Conclusion

This is the concluding chapter of this master thesis. Research questions are answered, the aggregated findings are presented and their implications and contributions are discussed. Suggestions for further research are also given.

6.1 Findings

The Exploring Digital Framework

An extensive literature review evidenced that organizations struggle to set the right priorities and pursue the right digital initiatives. The Exploring Digital Framework was developed as tool to maneuver this complexity, and derived from how academia discusses and how practitioners orientate digital strategy and digital transformation. The result is a digital roadmap.

The working hypothesis of this master thesis was that the problematic situation of digital disorientation partially derived from "an absence of a tool that allows for exploring, navigating, and structuring organizations' approach towards becoming more digital". Based on the case study, this hypothesis is strengthened. Furthermore, the Exploring Digital Framework seems to fulfill the requirements of such a tool, and its legitimacy is therefore validated.

While neither one of the two case companies had any reflections concerning digital that could not be covered by the Exploring Digital Framework, the framework is still not necessarily perfect. Just as all frameworks, the Exploring Digital Framework is a simplification of reality. This especially applies to the value-centric dimension, which is made up of:

- Value proposition
- Infrastructure & processes
- Customer engagement

In reality, digital visions and initiatives are not always associated with only one of these sub-dimensions, but multiple. Such instances are however exceptions, but still imply that these sub-dimensions are somewhat entangled. Also, the infrastructure and processes sub-dimension was perceived as rather extensive and overwhelming. This perception is justifiable. As illustrated in Table 5, this sub-dimension is clearly extensive. It corresponds to various supporting functions,

such as finance and IT (supporting internal processes), Human Resources (skill sets and talent acquisition), as well as primary functions such as manufacturing and logistics. As much as these simplifications compromise actuality, the simplicity of the Exploring Digital Framework is also its strength. By accepting simplicity, the Exploring Digital Framework compromises actuality for practicality.

RQ1: What is the current digital state of business?

The value proposition consists of physical products with negligible digital features and there are no substantial digital service offerings in place. The value lies in the hardware, and intuitively does so due to industry characteristics, inherent product aspects, and that the core business simply revolves around physical products. However, there exists a feeling of being in digital debt, with numerous digital initiatives having to be pursued at the same time to mitigate the risk of digital disruption.

There are discrepancies whether companies use digital assessments and benchmarking to objectively determine their true digital state. Using these tools lead to greater self-awareness, while not using them lead to overestimation of the digital state and self-proclaimed digital maturity.

Manufacturing processes are core and are receiving growing attention. However, the digital state ranges from conceptual stages of smart manufacturing to fully developed industry 4.0 environments. The operational backbone and enabling infrastructure for digital service platforms are under progress. Both supporting internal processes and the supply chains are sophisticated but conventional, or in other words automated and well-functioning but not necessarily digitally enhanced. There are discrepancies regarding structural aspects. Not all companies have digital strategies, clearly defined ownership, governance models and an organizational structure that support digital transformation.

Focus has been redirected away from customer engagement as of now, and its digital state ranges from non-existent to substantial. The ambiguous digital state of customer engagement derives from discrepant initial digital focus between front office and back office.

RQ2: What is the digital vision, and what digital priorities correspond to this vision?

The digital vision for the value proposition is harmonized and revolves around making products digitally active through connectivity, and digitally traceable through traceability. Both connectivity and traceability are key building blocks for a future digital service offering and servitization. There is distinctive self-confidence in the technological ability to achieve this vision. Instead, the uncertainty lies in the business aspects of servitizing the business model. Absent or inadequate digital strategy, and lacking ownership and governance, aggravates this difficult but necessary business model reinvention.

As the infrastructure and processes are receiving growing attention, Swedish manufacturing companies have come to realize that the back office must be prioritized before front office benefits can be exploited. The operational backbone should be the primary priority as it enables a servitized value proposition and its deliverance. Continuous improvements and extensions of the operational backbone is a way to prepare and hedge for the digital future. Compatibility with future digital technologies and concepts is prioritized.

Regardless of the current digital state of manufacturing, there are visions of a not so distant completely smart manufacturing. Swedish manufacturing companies see digital as a tool for leaner operations. There is emphasis on the difference between automation and digitalization.

Automation seems to be sufficient for supporting internal processes. The same reasoning applies to the supply chain, apart from the digital aspects needed for increased transparency and traceability. However, the distinction between automation and digitalization is more a question of definition. Sometimes automation is good enough, and sometimes automation is digitalization.

The aftermarket is believed to hold significant business potential and is envisioned to be tapped by servitization. Predictive maintenance is an example of a potential aftermarket service. Furthermore, servitization takes place in the borderline between the value proposition and customer engagement, and is enabled by the operational backbone and a digital service platform. In this sense, the value proposition, infrastructure, processes and customer engagement seem entangled. As the value proposition, infrastructure and processes are primary priorities, digital advancements in these areas aim to have positive spillover effects on customer engagement.

Digital debt makes prioritization and focus of digital initiatives complex. Thus, the establishment of digital strategy, ownership and governance are to be prioritized to mitigate such complexity. Pursuing these priorities indirectly facilitates servitization of business models.

RQ3: What digital initiatives are currently being pursued?

The digital initiatives are aligned with the digital vision. Business model implications are under an early state of investigation, and technological digital initiatives are spread over various stages of digital development. At a more mature stage, digital service platform solutions are being developed. At a less mature stage, small scale testing of conceptual connectivity solutions is being performed. Traceability is a concept under investigations, but not a subject of transformational effort as of now.

Regarding infrastructure and processes, digital initiatives seem to revolve around manufacturing processes, ownership, supporting organizational structure and governance. System support and IT infrastructure for smart manufacturing are being established. Ownership is being clarified by appointing a CDO, or by making the CIO shoulder CDO responsibilities. Digital initiatives for governance and organizational structuring are being pursued to support and facilitate digital transformation. However, pursuing such structural digital initiatives without a digital strategy seems to lead to sub-optimal ad hoc solutions, with decentralized and scattered allocation of responsibility as a result. A digital strategy is guiding in terms of focus and prioritization, and seems to facilitate clarification of ownership, governing and organizational structuring, with centralized and distinctive allocation of responsibility as a result.

On the customer engagement side, initiatives are taken to get digitally closer to the customers. New ways of digital interaction are established, for example by using QR codes. However, customer engagement is not a primary priority as of now, which is reflected by the thinly number of digital initiatives in this area. Instead, companies are hoping for spillover effects from digital initiatives for the value proposition, infrastructure and processes.

To support the digital agenda, Swedish manufacturing companies are continuously upskilling and reskilling employees as well as acquiring new digital talent. Companies utilize both approaches, but tend to lean more toward either the internal or external side of the spectrum. As digital is believed to have an impact on the overall market structure and influence how future business is conducted, scenarios for desirable partnerships and digital ecosystems are built.

RQ4: What are the digital drivers, and who drives the digital agenda?
Who shoulders the role of the digital driver varies, and all companies have not yet made a conscious choice of ownership. Consciously clarifying ownership signalizes that digital transformation is in fact a high priority, while not doing so has the opposite effect. When making the conscious choice of clarifying ownership, a CDO and central ownership seems to be the go-to approach. When not doing so, ownership is unconsciously spread over lower levels in the organization, increasing the risk of scattered and misaligned digital efforts between business units. This will make finding the right pace of digital transformation and the right mix between traditional and digital capabilities and assets even more complex. That is, complicate techquilibrium. Having a clear and consciously chosen digital driver, either an individual or a team, seems to have a positive influence on digital transformation.

Looking at what drives digital, the top five digital drivers in no particular order seem to be:

- **New business opportunities and increase revenue**
    - This represents an external focus of which digital technologies and concepts could reveal new business opportunities and revenue streams. An example of such a new business opportunity is servitization of the aftermarket.
- **Leaner and more efficient operations**
    - This represents an internal focus of striving towards operational excellence. Digital technologies and concepts could reduce lead times and waste, resulting in cost savings.
- **Further strengthen core values**
    - Businesses revolve around their core values, and digital technologies and concepts could be utilized to further strengthen these values. Example of such core values are functionality, quality and safety.
- **Getting a competitive edge**
    - As competition is growing, differentiation is required. Companies could differentiate themselves by utilizing digital technologies and concepts, resulting in a competitive advantage. For example, becoming more digital allows for a more innovative image which in turn could facilitate attraction of digital talent.
- **Expectations of customers**
    - As digital is receiving growing attention, customer expectations continuously grow. Customers expect their counterpart to conduct business and operate in a more digital way. For example, customers appreciate ease of doing business and wants to lower their administrative burden through digitally enhanced interaction.

RQ5: What are the digital challenges?
Digital challenges include both challenges of setting the direction and pace of digital development, and carrying through digital transformation along this direction in the desirable pace. That is, challenges of both digital strategy and digital transformation, respectively.

The top three digital challenges for setting the direction pace of digital development, that is digital strategy, in no particular order seem to be:

- **Building an adequate digital strategy and enable executional excellence**
    - A key digital challenge is to build an adequate digital strategy that balances both deliberate and emergent aspects. That is, both structure and flexibility is needed. Thereafter, ownership, supporting organizational structure and governance must be established to enable its execution. This trinity, ownership, organizational structure and governance, is the first step towards a conscious and intentional approach of becoming digital. Taking this first step is challenging.
- **Avoiding or getting out of digital debt**
    - Being in digital debt is the result of lacking digital advancements in the recent past, resulting in that much must be done at the same time in the present or near future to mitigate the risk of digital disruption. Digital debt complicates prioritization and focusing of efforts, causing digital paralysis, impatience and frustration. This further complicates achieving techquilibrium.
- **Grasping and meeting customer expectations**
    - When the business environment makes digital advancements, customer expectations grow. When customer expectations grow, so does the difficulty of meeting them. Additionally, growing customer expectations also complicates the task of grasping them. Intuitively, it is nearly impossible to meet customer expectation that you do not know of.

The top three digital challenges for carrying through digital transformation in no particular order seem to be:

- **Getting the organization onboard**
    - As with all transformation, digital transformation relies on traditional change management aspects. In traditional manufacturing companies, mechanical expertise is prestigious and anchored in the organizational culture, resulting in resistances to digital advancements. It is challenging to balance existing expertise with new digital talent, and to convince the organization that digital is not about moving away from making world class physical products, but rather to complement these by placing a digital service offering on top.
- **Realizing and proving benefits and business cases**
    - Companies cannot pursue digital initiatives just for the sake of it, or just because competitors do it. Every transformational effort must be substantiated with a clear purpose. However, realizing and proving benefits and business cases are challenging, especially for novel digital technologies and concepts.
- **Backing up technological advancement with business model reinvention**
    - Traditional manufacturing companies are confident in their ability to technologically absorb digital technologies and concepts. Instead, the uncertainty lies in the business aspects of servitizing the business model. Technological advancements reveal new business opportunities, while adaptation of the business model captures them. This is challenging as both the own organization and its customers must be familiarized with servitization.

6.2 Implications and Contributions

6.2.1 Theoretical Implications and Contributions

This master thesis clarified and extended the vocabulary in the digital sphere of academia. Well-established terms such as “digitalization”, “digital strategy” and “digital transformation” were reviewed and contextualized. Novel terms such as “digital debt”, “digital surplus” and “techquilibrium” were reviewed, complementary redefined and contextualized. Altogether, this master thesis has made contribution to the academic vocabulary that surrounds the digital phenomenon.

The Exploring Digital Framework is an academic knowledge contribution in the areas of digital strategy and digital transformation. Academia could utilize this framework to further explore the digital phenomenon, thus revealing new opportunities for increased academic understanding of digital. This framework could also be used for educational purposes, for example to solve cases or facilitate discussions within university courses concerning, or in close perimeter to, digital strategy and digital transformation.

6.2.2 Practical Implications and Contributions

Intuitively, the risks of digital disorientation and digital disruption are higher, and avoiding digital debt and achieving techquilibrium are harder, in business environments where digital advancements are rapid and discontinuous. Companies in business environments with such characteristics could surely benefit from having a deliberate digital strategy. However, such environmental conditions hardly support articulation and effective execution of a purely deliberate digital strategy. Thus, emergent tendencies must be incorporated to ensure the flexibility needed to meet digitalization successfully. In business environments where digital advancements are not as rapid and discontinuous, companies could get away with a less deliberate digital strategy, or even with not having a digital strategy at all. If digitalization is not happening, there is no need for tools to navigate it. However, digitalization is happening in most industries, and the Swedish manufacturing industry is one of them. The Exploring Digital Framework provides excellent support in the initial discussions of building a digital strategy, whether it is deliberate or emergent, or both.

Practitioners could use the Exploring Digital Framework to structure their thoughts and to explore scenarios for digital strategies, and to bring awareness to the organization’s approach towards digital transformation. The Exploring Digital Framework is a digital roadmap. Building and executing a digital strategy should be an interactive top-down process, with clear directives communicated downstream from top management. Ignoring this could lead to scattered and misaligned efforts, lack of focus, and difficulties in setting priorities. The Exploring Digital Framework counteracts such complexities and facilitates strategic alignment and coordination of efforts.

Furthermore, the Exploring Digital Framework could assist practitioners when conducting digital assessments. Objectively assessing your digital maturity is key to avoid stumbling around blindfolded or ignorantly overestimating your true digital state. Achieving digital success seems to require humbling of the organization and acceptance of current inadequacies. The Exploring Digital Framework could facilitate such procedures.

Utilizing the Exploring Digital Framework could counteract both digital impatience and digital paralysis. Organizations cannot pursue non-substantiated digital initiatives because of competitive pressure. More so, it is certainly unwise to engage in digital transformation and establish pretentious digital strategies solely because of the beliefs that everyone else is leaping ahead in terms of digital presence. Neither can organizations opt for doing nothing rather than something, as they feel overwhelmed by digital. The Exploring Digital Framework facilitates focusing of efforts and prioritization, and most importantly helps organizations to put digital in the spotlight. Concludingly, the Exploring Digital Framework is a tool for the emerging role of the CDO, used to explore, navigate, and structure digital.

6.3 Suggestions for Further Research

As illustrated in this master thesis, the Exploring Digital Framework has multiple areas of applicability. Thus, this master thesis reveals several research opportunities in which the Exploring Digital Framework could be further explored and validated. For example, it could be applied:

- in a more extensive qualitative case study within the manufacturing industry for further validation.
- in a quantitative case study in which companies use self-assessment. This could further validate the framework's simplicity and ease of use.
- to build digital strategies. This could further validate its usability as a digital roadmap.
- to other industries, geographical regions and to companies of various size. This could validate its generality.

Furthermore, the concepts of digital debt, digital surplus, and techquilibrium are still relatively unexplored and could be subjects for further research. As digitalization is ever-growing, so is the vocabulary that surrounds it. This requires continuous literature reviews to compile, consolidate and align the academic vocabulary within the digital sphere. Thus, literature reviews on vocabulary and definitions are persistently relevant for rapidly growing subjects such as digital.

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Appendix A: Main Search Keywords

To ensure repeatability and trustworthiness of the literature review, a list of the main keywords is given:

- Business model innovation
- Chief Digital Officer
- Critical success factors
- Critical success factors ‘AND’ Transformation
- Critical success factors ‘AND’ Digital
- Digital
- Digital ‘AND’ Manufacturing
- Digital ‘AND’ IT strategy
- Digitalization
- Digitalization ‘AND’ Business model
- Digitalization ‘AND’ Strategy
- Digital business
- Digital business model
- Digital business strategy
- Digital disruption
- Digital ecosystems
- Digital innovation
- Digital strategy
- Digital transformation
- Digital transformation strategy
- Digital technologies
- Industry 4.0
- Servitization
- Servitization ‘AND’ Manufacturing
- Technology ‘AND’ Transformation

Appendix B: Interview Guide

Introduction – Master thesis context and interview structure
This study revolves around digital strategy and digital transformation. The scope of this master thesis is to explore how Swedish manufacturing companies envision their future digitally enhanced business and how they set priorities in accordance with this digital vision – digital strategy. The scope also includes how these companies approach their digital vision through actions and initiatives – digital transformation. The exploration of digital strategy and digital transformation is divided into three areas: (1) value proposition, (2) infrastructure and processes, and (3) customer engagement. That is, how companies reshape customer value, transform value creation, and enhance value deliverance by leveraging digital technologies and concepts. These three areas also resemble the interview structure.

Introductory and general questions
- In just a few sentences, what do your company do?
- In short, what is your role within the organization? What are your responsibilities?
- What do you think of your current digital state in comparison to your competitors'?
- How do you think your competitors are acting in terms of digital transformation?
- Are you leading, following or lagging in terms of digital presence within your industry?
- Is digital transformation a no, low, medium, high or top priority?
- Do you have an explicit digital strategy, or do you work it out as it goes along?
- What is the right amount of digital?

Reshape value – value proposition
The value proposition refers to the value that is offered to the customers – what the customer ultimately pays for. That is, the products and services.

- Digital state:
  - What is the digital state of your organization's value proposition? (products and services)
- Digital vision and digital priorities:
  - How do your organization envision its future digitally enhanced value proposition?
  - What priorities correspond to this vision?
- Digital initiatives:
  - What digital initiatives are your organization currently taking to digitally transform its value proposition?
- Digital drivers:
  - What is driving the digital transformation of the value proposition?
  - Who is driving the digital transformation of the value proposition?
- Digital challenges:
  - What are the challenges of building a digital strategy regarding the value proposition?

- What are the challenges of carrying through digital transformation regarding the value proposition?

Transform value creation – infrastructure and processes
Infrastructure and processes refer to everything that either enables value creation or directly creates value. Examples of what enables value creation is: the supply chain (supply side), supporting internal processes, platforms, organizational structure, partnerships, and skill sets. Examples of what creates value is: manufacturing processes and the supply chain (demand side).

- Digital state:
  - What is the digital state of your organization's infrastructure and processes?
- Digital vision and digital priorities:
  - How do your organization envision its future digitally enhanced infrastructure and processes?
  - What priorities correspond to this vision?
- Digital initiatives:
  - What digital initiatives are your organization currently taking to digitally transform its infrastructure and processes?
- Digital drivers:
  - What is driving the digital transformation of the infrastructure and processes?
  - Who is driving the digital transformation of the infrastructure and processes?
- Digital challenges:
  - What are the challenges of building a digital strategy regarding the infrastructure and processes?
  - What are the challenges of carrying through digital transformation regarding infrastructure and processes?

Enhance value deliverance – customer engagement
Customer engagement refers to everything that is related to either the interaction with customers or the transaction of value from the organization to customers. The interaction with customers refers to the customer interface, the customer journey and the entirety of the customer experience. The transaction of value refers to how the value proposition is delivered to the customer. Beware of the overlapping with the "value creation"-category: the value deliverance itself could also create customer value.

- Digital state:
  - What is the digital state of your organization's way of engaging with customers?
- Digital vision and digital priorities:
  - How do your organization envision its future digitally enhanced way of engaging with customers?
  - What priorities correspond to this vision?
- Digital initiatives:
  - What digital initiatives are your organization currently taking to digitally transform its way of engaging with customers?
- Digital drivers:
  - What is driving the digital transformation of customer engagement?
  - Who is driving the digital transformation of customer engagement?
- Digital challenges:
  - What are the challenges of building a digital strategy regarding customer engagement?

- What are the challenges of carrying through digital transformation regarding customer engagement?

Validating questions

- Do you have anything to add regarding digital strategy or digital transformation in the context of your organization?
- Are there other areas than the value proposition, infrastructure and processes and customer engagement in which your organization leverages, or aims to leverage, digital technologies and concepts?