

# The process of executing digital transformation strategies:

*Case studies in established Swedish manufacturing firms*

Martin Andreasson





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**The process of executing digital transformation strategies:**  
Case studies in established Swedish manufacturing firms.

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*Ā ka mate! Ka mate! Ka ora!*

*Ā ka mate! Ka mate! Ka ora!*

*(I die, I die, I live)*

*(I die, I die, I live)*

*Upane! Ka upane!*

*Upane! Ka upane! Whiti te rā!*

*(For I rise up and begin to climb,*

*I ascend to the summit, the sun shines!)*

Parts of the “Ka Mate” haka composed by Te Rauparaha circa 1820, recomposed and performed by the All Blacks.



## Abstract

The emergence of digital technologies has forced established firms to engage in a digital transformation. Digital transformations are complex and time-consuming processes, and therefore, they require unique strategies for coordinating and prioritizing activities. Existing research provides some examples of established Swedish firms engaging in digital transformations to keep up with competition. Responding to the need to better understand *how* these firms approach their digital transformation, this thesis explores how digital transformation strategies have been executed by established Swedish manufacturing firms and why some digital transformation strategies are realized whereas others are not.

This thesis builds on digital transformation and digital transformation strategy literature. The term “digital transformation” primarily refers to firms’ incorporation of digital technologies into products and services, the development of new digital business models, and new organizational setups. The term “digital transformation strategy,” likewise, refers to the process of executing the digital transformation.

To answer the research questions presented in this thesis, I conducted two studies at two different firms. Study 1 was an embedded longitudinal single-case study conducted at the corporate unit and two business units of one firm and includes 30 interviews. Study 2 was a multiple-case study conducted at two firms and included six cases and a total of nine interviews.

This thesis’ examination of digital transformation strategies demonstrates how the firms incorporated both basic- and advanced-level digital technologies into existing and new products and created new digital services. The firms also implemented new business models, such as e-commerce channels and pay-per-use payment schemes. Further, the firms also introduced new organizational setups, such as cross-functional teams and departments specializing in digital technologies and their potential applications. The execution of the digital transformation strategies was dynamic, and the firms regularly reformulated their strategies throughout the process. Furthermore, this study’s analysis of the execution of digital transformation strategies highlighted how managers interpreted the firm’s intentions and created emergent strategic responses to adapt to new digital technologies and customer demands. The firms measured the outcomes of the digital transformation strategy by considering both traditional measurements, such as return on investment, and new measurements, such as positive brand image and customer engagement.

The thesis identified three key elements that impact whether or not a firm is able to realize its digital transformation strategy. First, new digital products and services must be aligned with market demands and customer needs. Second, internal and external collaboration support digital product and service development. Third, all dimensions of the digital transformation must be managed to avoid creating a misalignment between the firm’s digital transformation strategy and current business strategy.

The execution of a digital transformation strategy requires managers to constantly reevaluate the strategy and respond to changing customer demands and available digital technologies. The lessons of this thesis can provide managers within digitally transforming firms with useful tools to improve the execution process of their digital transformation strategy.



## Sammanfattning

Framväxten av digital teknologi har tvingat etablerade företag att engagera sig i en digital transformation. Digitala transformationer är komplexa och tidskrävande processer, och därför kräver de egna strategier för att samordna och prioritera aktiviteter. Befintlig forskning ger några exempel på etablerade svenska företag som engagerat sig i digitala transformationer för att hålla jämna steg med konkurrenterna. Som svar på behovet av att bättre förstå *hur* dessa företag hanterar sin digitala transformation undersöker denna avhandling hur digitala transformationsstrategier har genomförts av etablerade svenska tillverkande företag och varför vissa digitala transformationsstrategier realiserats medan andra inte gör det.

Denna avhandling bygger på litteratur om digitala transformationer och digitala transformationsstrategier. Termen "digital transformation" syftar främst på företags integration av digital teknologi i produkter och tjänster, utvecklingen av nya digitala affärsmodeller och nya organisatoriska utformningar. Termen "digital transformationsstrategi" syftar på processen för hur ett företag genomför en digital transformation.

För att besvara avhandlingens forskningsfrågor genomförde jag två studier på två olika företag. Studie 1 var en integrerad longitudinell fallstudie som genomfördes på företagsenheten och två affärsenheter på ett företag och omfattade 30 intervjuer. Studie 2 var en flerfallstudie som genomfördes på två företag och inkluderade sex fall och totalt nio intervjuer.

Den här avhandlingens studier av digitala transformationsstrategier visar hur företagen integrerade både grundläggande och avancerad digital teknologi i befintliga och nya produkter och skapade nya digitala tjänster. Företagen implementerade också nya affärsmodeller, såsom e-handelskanaler och betalningssystem för betala-per-användning. Dessutom införde företagen nya organisatoriska utformningar, såsom tvärfunktionella team och avdelningar som specialiserar sig på digital teknologi och dess potentiella tillämpningar. Genomförandet av de digitala transformationsstrategierna var dynamisk, och företagen omformulerade regelbundet sina strategier under hela implementeringsprocessen. Avhandlingens analys av genomförandet av digitala transformationsstrategier belyste dessutom hur cheferna tolkade företagets avsikter och utformade strategiska svar för att anpassa sig till ny digital teknologi och kundernas krav. Företagen mätte resultaten av den digitala transformationsstrategin genom att inkludera både traditionella mått, som avkastning på investeringar, och nya mått, som positiv varumärkesimage och kundengagemang.

Avhandlingen identifierade tre viktiga element som påverkar huruvida ett företag kan eller inte kan förverkliga sin digitala transformationsstrategi. För det första måste nya digitala produkter och tjänster anpassas till marknadens krav och kundernas behov. För det andra måste interna och externa samarbeten stödja utvecklingen av digitala produkter och tjänster. För det tredje måste alla dimensioner av den digitala transformationen hanteras för att undvika att skapa en missanpassning mellan företagets digitala transformationsstrategi och nuvarande affärsstrategi.

Genomförandet av en digital transformationsstrategi kräver att cheferna ständigt omvärderar strategin och reagerar på förändrade kundkrav och tillgänglig digital teknologi. Lärdomarna från denna avhandling kan ge chefer inom digitalt transformerande företag användbara verktyg för att förbättra genomförandeprocessen av digitala transformationsstrategier.



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In the Thanksgiving episode of the fifth season of the television show *Friends*, Monica, in typical American fashion, asks everyone what they are thankful for after sharing a marvelous Thanksgiving dinner. Ross answers, “I don’t know what to pick. Am I more thankful for my divorce or my eviction?” Phoebe, not understanding the sarcasm of Ross’s answer, replies, “Wow. See, and I didn’t think you’d be able to come up with anything.” In my acknowledgments, I would like to thank several people who have helped me during my PhD process, for which I am truly thankful.

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# 1. Introduction

*“I would say that, from the beginning, of course, everything was chaos, and there were a lot of meetings and this or that, and nothing [products] was connected. So, there were both a lot of discussions: What could we do if we were connected, and how should we connect [the products]? But I think it's gone from like, what can we do and how can we connect it to now, okay, now we're connected, we have some services. What new services could we add? What new functions or ideas could we add? Sort of, I would say. So, the connectivity has matured a lot. Like, connectivity, in itself, is not something that we work so much on today, I would say it's, now it's more like, what can we do with what we have?”*

*“I would say that from 2010 to 2016, it was like everything was a bit crazy and there were a lot of discussions... And I would say from 2017 to 2020, it's been like maturing.”*

This quotation is the recollection and reflection of a software architect engineer working with digital technologies who has been involved in the digital transformation at one of the studied firms included in this thesis (for privacy reasons, it is referred to as “Firm South”). The quote exemplifies how a leading product-centered manufacturing firm consisting of a corporate unit and three independent business units responded to the disruptions created by digital technologies, as well as their long and tumultuous journey towards a digital transformation.

Digital technologies, such as social media, mobile technologies, cloud computing, and the Internet of Things (Sebastian et al., 2020), have become an integral part of most people's everyday lives. This is because digital technologies “cross traditional industry/sectoral boundaries... and accelerate the inception, scaling, and evolution of new ventures” (Nambisan et al., 2019, p. 1). Born-digital firms, which are firms that have been digitalized since their foundation and are built on digital technologies (Monaghan et al., 2020), are rapidly innovating by using new digital technologies. This has led born-digital firms to develop creative solutions that challenge and disrupt established firms' existing products and markets (Nambisan et al., 2019; Porter & Heppelmann, 2014). Therefore, established firms are faced with the urgent challenge of responding to such disruptions and executing new strategies to transform themselves and remain competitive in markets impacted by digital technologies (Nambisan et al., 2019; Warner & Wäger, 2019).

Existing research highlights how established firms are strategically transforming themselves in response to digital technologies and new competition. New digital business strategies guide how firms can leverage digital technologies and identify potential business opportunities (Bharadwaj et al., 2013). Adding sensors and connectivity to existing products enables established firms to collect data that can be used to improve future products and provide customers with product insights (Porter & Heppelmann, 2015). Established firms are also developing digital platforms that gather product data and make it accessible to internal development teams and external customers (Correani et al., 2020). Digital platforms also enable established firms to offer products as a service (Paschou et al., 2020), which can affect

the firm's business model. This leads established firms to fundamentally reconsider how they create and capture value (Klos et al., 2021). Established firms can also increase their digital innovativeness further by decentralizing operations and enabling cross-functional collaboration between departments (Vial, 2019). The transformative initiatives described above are some examples of activities encompassed by the term *digital transformation*, which this thesis defines as a change in how a firm deploys digital technologies to develop new digital products and services and digital business models, as well as make changes to the organizational setup with the aim of reaching new markets and customers and creating and appropriating more value for the firm (for elaboration on this definition, see Chapter 2.2). Engaging in a digital transformation push established firms to reconsider and reformulate most of their critical business activities to achieve desired outcomes.

Researchers have argued that the depth and breadth of this organizational change imply that digital transformations require their own strategies (Chanias & Hess, 2016; Chanias et al., 2019; Hess et al., 2016; Matt et al., 2015). A *digital transformation strategy* is concerned with the execution of a digital transformation—that is, the entire process from initiation to implementation and finally measuring outcomes (for elaboration on this definition, see Chapter 2.3). Moreover, a digital transformation strategy “seek to coordinate and prioritize the many independent threads of digital transformation” (Matt et al., 2015, p. 339). The digital transformation strategy is, therefore, a holistic strategy that guides managers to manage the digital transformation and which business activities to change.

Recent research has provided examples of realized digital transformation strategies in established firms. Correani et al. (2020) describe ABB, a Swedish–Swiss manufacturer of power and automation technologies, who managed to create digital services and new business models. Sebastian et al. (2020) explain that the Danish toy manufacturer LEGO enhanced their products and customer engagement by leveraging digital technologies. Svahn et al. (2017) and Björkdahl (2020) describe Swedish car manufacturer Volvo's integration of digital technologies into its cars and product development processes to respond to increased innovation from competitors and customer demands. These examples highlight that established firms can respond to disruptive digital technologies and are strategically implementing digital transformations.

The ambition of a digital transformation is to improve the firm's ability to utilize the opportunities with digital technologies; however, empirical research and consultancy reports suggest that most firms' digital transformation strategies fail to realize their intended outcomes. For instance, Tabrizi et al. (2019) found that approximately 70% of firms that engaged in a digital transformation failed to realize their stated objectives, and McKinsey (2018) reported a digital transformation failure rate of 80% in 2016 and 84% in 2018. Further, Björkdahl (2020) documented Swedish telecommunications firm Ericsson's newly established Digital Services division, who managed to create an entirely new digital product and service portfolio. Despite this achievement, the division reported a loss of almost \$5 billion between 2017 and 2018, forcing them to suspend most of their offerings.

The quotation that begins this chapter and the examples of both realized and unrealized digital transformation strategies provided above reveal that they are complex processes and that

established firms often struggle to execute their digital transformation strategies. While some established firms, such as Volvo, were able to effectively respond to the rise of digital technologies, others, such as Ericsson, struggled. Previous studies have identified challenges for established firms related to their ability to change business activities in the digital transformation, and have provided frameworks describing the digital transformation (Hanelt et al., 2021; Imran et al., 2021; Verhoef et al., 2021; Vial, 2019). However, fewer studies have analyzed *how* digital transformation strategies are executed by established firms; that is, few studies have examined the entire process from initiation to implementation and finally outcomes (Chanias & Hess, 2016; Chanias et al., 2019; Yeow et al., 2018). As explained by Chanias et al., there is a lack of studies “relating to the process, success, risks, and failures of digital transformation” (2019, p. 31). They further suggest that studying the execution process of digital transformation strategies can provide insight into how firms are adjusting their critical business activities, as well as the outcomes of these strategies.

Sebastian et al. (2020) further argue that there is a discrepancy between digital transformation intentions and outcomes and that established firms experience less difficulty defining their intended digital transformation strategy than realizing it. Mintzberg and Waters (1985) state that very few strategies are realized as intended and that the unanticipated challenges that arise during strategy execution require emergent strategic responses. When executing a digital transformation strategy, established firms are continuously challenged by the introduction of new digital technologies, changes in markets and customer demands, and increased digital competition from traditional and born-digital firms. An intended digital transformation strategy, therefore, needs to be complemented by emergent strategic responses that can handle the previously mentioned challenges. In response to the call by Chanias et al. (2019) for more research that investigates both realized and unrealized digital transformation strategies, this thesis specifically examines why some digital transformation strategies are realized and others are not.

This thesis, therefore, aims to expand the scholarly understanding of how digital transformation strategies are executed in established firms. Specifically, this thesis seeks to explain the process by which established firms execute digital transformation strategies and provide insight into why some digital transformation strategies are realized while others are not. Thus, this thesis asks the following research questions:

*RQ1: How are digital transformation strategies executed within established firms?*

*RQ2: Why are some digital transformation strategies realized, while others are not, in established firms?*

The thesis involved two case studies at two established Swedish manufacturing firms to help answer these research questions. One of the firms is incorporating one corporate unit and three business units (two of which are included in the study), and the other is a single-business firm. The intention is not to compare the firms but rather to provide a broader understanding of the digital transformation strategy process within established firms.

This thesis is divided into eight chapters. In Chapter 2, I rely on current literature to define three concepts that are critical to this thesis: digital technologies, digital transformation, and

digital transformation strategy. In Chapter 3, I present a conceptual framework that is based on the definitions from Chapter 2 and the strategy process perspective. In Chapter 4, I explain my methodological approach, the research design of the two case studies, and reflections on my methodological choices. In Chapter 5, I present the two appended papers and connect them to the thesis. Chapter 6 includes my analysis of the findings from the two appended papers and provides answers to the two research questions of the thesis. Chapter 7 contains a brief discussion of the meaning of the dynamic strategy process and outlines the difference between a realized and a successful digital transformation strategy. Chapter 8 presents the conclusions of the thesis, theoretical and managerial implications, and potential future research.

## 2. Conceptual definitions

The primary focus of this thesis is the digital transformation strategies of established firms. Before exploring this specific topic more deeply, it is necessary to first define the term *digital technologies*, which, in turn, is crucial to defining the terms *digital transformation* and *digital transformation strategy*. First, I will examine various definitions of these terms and subsequently present the specific definitions that will be used throughout the thesis.

### 2.1. Digital technologies

Vial (2019) states that researchers studying digital transformations often provide vague definitions of what they consider to be digital technologies. This lack of precision can lead to confusion about what the term digital transformation implies. As Table 1 demonstrates, definitions of digital technologies vary in meaning, and therefore, more attention must be paid to defining what digital technologies are. Indeed, establishing a precise definition of digital technologies can bring clarity to understanding their role in a digital transformation, which, in turn, will establish a stronger foundation for this thesis.

The definitions presented in Table 1 demonstrate that researchers generally agree that digital technologies are a set of technologies that depend on each other. For instance, Bharadwaj et al. (2013) specifically emphasize the combination of several digital technologies for information, computing, communication, and connectivity. Holland and Kavuri (2021) similarly assert that digital technologies are used to process, analyze, and store data using various systems and devices. Iben and Laryea (2014) and Hadlington and Scase (2018) emphasize that the binary computer language enables data to be collected, stored, read, and transferred between devices and systems. Wong et al. (2018) highlight that digital technologies therefore improve the flexibility, accuracy, and immediacy of communication between devices and systems. Hadlington and Scase (2018) and Naslund et al. (2019) specifically refer to smartphones and laptops as examples of such devices; Bharadwaj et al. (2013), Holland and Kavuri (2021), and Pietronudo et al. (2022) use more general terms, such as connectivity, software, and IoT.

As Table 1 shows, there are two general themes of definitions of digital technologies in the studied literature. One stream of literature (Iben & Laryea, 2014; Wong et al., 2018) describes digital technologies as enablers of future development and value creation (function); another stream of literature (Bharadwaj et al., 2013; Hadlington & Scase, 2018; Naslund et al., 2019; Pietronudo et al., 2022) describes digital technologies as tools (what they are). The functions perspective defines digital technologies based on their abilities, such as collecting, storing, processing, and transferring data (Iben & Laryea, 2014). These abilities can then improve the speed and accuracy of communication and allow for flexible system arrangements (Wong et al., 2018). The tools perspective instead portrays digital technologies as what they are. This perspective sometimes describes digital technologies as either hardware or software technologies (Pietronudo et al., 2022), and sometimes as the combination of both hardware and software (Bharadwaj et al., 2013). Hardware includes smartphones, laptops, computers, and sensors that collect and process data, and software includes applications, platforms, and networks (Hadlington & Scase, 2018; Naslund et al., 2019). Combinatory technologies include communication devices, connectivity technology, and the Internet of Things.

Table 1: Definitions of digital technologies.

Authors	Definition	Categorization
(Ibem & Laryea, 2014, p. 12)	“Digital technologies (DTs) generally refer to information and communication technologies (ICTs) that enable the production, storage and handling of information, and facilitate different forms of communication between human beings and electronic systems and among electronic systems in digital, binary computer language.”	Digital technologies as function
(Wong et al., 2018, p. 313)	“DT is considered the division of ‘scientific or engineering knowledge that deals with the establishment and application of computerised or digital devices, methods, systems etc.’, which can improve the immediacy, accuracy and flexibility of communication.”	
(Naslund et al., 2019, p. 3)	“[W]e define digital technology as mobile devices such as cellphones or smartphones, mobile applications, wearable devices and sensors, telepsychiatry applications, and online platforms.”	Digital technologies as tools
(Hadlington & Scase, 2018, p. 4)	“[D]igital technology is defined as any device that functions using a binary computational code (including smartphones, laptops, computers), as well as services associated with such (e.g. the Internet, Wi-Fi, Social Networking).”	
(Pietronudo et al., 2022, p. 870)	“A digital technology is defined as a set of information technology artifacts augmented by third-party peripheral derivatives such as hardware and software systems that facilitate the integration of business resources with those of the business ecosystems.”	
(Bharadwaj et al., 2013, p. 471)	“[D]igital technologies (viewed as combinations of information, computing, communication, and connectivity technologies)”	
(Holland & Kavuri, 2021, p. 104)	“Digital technology is defined as the set of technologies that are used to process, analyze, store, move, and interpret data, which includes cloud computing, enterprise systems, data networks, computer hardware, software, social networks, mobile systems, and internet of things (IoT).”	Digital technologies as both function and tools

Examining both the functions and tools perspectives can provide a deeper understanding of digital technologies. Combining both perspectives considers digital technologies’ practical applications, hardware and software components, as well as the synergistic effects that arise

from their integration. The functions and tools perspectives are both divergent and complementary, as they describe both types of technologies and their abilities and functions. Holland and Kavuri (2021, p. 104) used both perspectives to define digital technologies as “the set of technologies that are used to process, analyze, store, move, and interpret data, which includes cloud computing, enterprise systems, data networks, computer hardware, software, social networks, mobile systems, and internet of things (IoT).” This thesis adopts a simplified version of the definition of Holland and Kavuri (2021) to develop a definition of digital technologies that is more in line with the types of digital technologies used by the studied firms. This thesis, therefore, uses the following definition of digital technologies:

“Digital technologies are technologies used to process, analyze, store, move, and interpret data and include technologies such as cloud computing, data networks, software, and the IoT”.

## 2.2. Digital transformation

Similar to the confusion surrounding the term digital technologies, the term digital transformation also lacks a clear, unified definition (Vial, 2019). Although the term is frequently used by researchers, a consensus regarding its precise meaning has not been established (Siachou et al., 2021). To provide clarity, this section seeks to define the term digital transformation for this thesis.

The definitions in Table 2 emphasize the changes resulting from the use of various digital technologies. For example, Furr et al. (2022), Fitzgerald et al. (2014), and Verhoef et al. (2021) highlight the role of new business models for a digital transformation. While Furr et al. (2022) and Fitzgerald et al. (2014) only emphasize the adoption and use of new business models, Verhoef et al. (2021) specifically mention the potential of business models to generate value for firms. Three of the definitions in Table 2 emphasize the firm level organizational setup changes. Vial (2019) refers specifically to changes in the organization’s properties, and Fitzgerald et al. (2014) refer to the streamlining of operations. Verhoef et al. (2021) state that a digital transformation require firms to use digital technologies and place emphasis on *how* the firm employs such technologies. Westerman et al. (2014) discussed the increased capacity of the firm to expand into new markets and attract new customers.

The definitions in Table 2 are both overlapping and divergent. According to the most general definition, a digital transformation involves the use of digital technologies to improve the firm. As the introduction stated, most digital transformations fail (McKinsey, 2018; Tabrizi et al., 2019), and therefore, it is important to highlight that a digital transformation *intends* to improve the firm (Vial, 2019) according to certain performance criteria (Verhoef et al., 2021; Westerman et al., 2014). A digital transformation can lead to the adoption of new digital business models (Fitzgerald et al., 2014; Furr et al., 2022; Verhoef et al., 2021) and changes in the organizational setup (Fitzgerald et al., 2014; Verhoef et al., 2021; Vial, 2019) that can increase the firm’s ability to reach new markets and customers (Westerman et al., 2014) with new products and services. In this context, this thesis identified the following six aspects of a digital transformation: (1) digital technologies, (2) performance improvements, (3) digital business models, (4) organizational setup changes, (5) new markets and customers, and (6) new digital products and services.

Table 2: Definitions of a digital transformation.

Authors	Definition	Highlights of definition
(Westerman et al., 2014, p. 1)	“[T]he use of technology to radically improve performance or reach of enterprises.”	<ul style="list-style-type: none"> <li>• (Digital) technologies</li> <li>• Performance improvements</li> <li>• Increased reach</li> </ul>
(Vial, 2019, p. 118)	“[A] process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies.”	<ul style="list-style-type: none"> <li>• Digital technologies</li> <li>• Improvement (unclear what is improved)</li> <li>• Changes to organizational setup (significant changes to its properties)</li> </ul>
(Furr et al., 2022, p. 3)	“[T]he adoption of novel strategies and business models that are enabled by a myriad of new information technologies.”	<ul style="list-style-type: none"> <li>• Digital technologies</li> <li>• Business models</li> </ul>
(Verhoef et al., 2021, p. 889)	“[A] change in how a firm employs digital technologies, to develop a new digital business model that helps to create and appropriate more value for the firm.”	<ul style="list-style-type: none"> <li>• Digital technologies</li> <li>• Performance improvements (generate and appropriate additional value for the firm)</li> <li>• Business models</li> <li>• Changes to Organizational setup (change in how the firm employs digital technologies)</li> </ul>
(Fitzgerald et al., 2014, p. 2)	“[T]he use of new digital technologies, such as mobile, artificial intelligence, cloud, blockchain, and the Internet of things (IoT) technologies, to enable major business improvements to augment customer experience, streamline operations, or create new business models.”	<ul style="list-style-type: none"> <li>• Digital technologies</li> <li>• Improvement (unclear what is improved, but it leads to increased customer experience and operational efficiency)</li> <li>• Business models</li> <li>• Changes to organizational setup (increased operational efficiency)</li> </ul>

Based on the six aspects above, this thesis presents the following definition of a digital transformation:

“A digital transformation is a change in how a firm deploys digital technologies to develop new digital products and services, digital business models, and make organizational setup changes with the aim of reaching new markets and customers to generate and appropriate more value for the firm”.

### 2.3. Digital transformation strategy

As discussed by MacKay et al. (2020), despite the long history of research into strategic management, there is still a lack of consensus amongst researchers regarding the precise meaning of strategy. Porter (1996, p. 68), for example, defines strategy as “the creation of a unique and valuable position, involving a different set of activities.” He further argues that there is rarely a single ideal position, and that if there were, there would be no need for a strategy. Mintzberg (1978, p. 935), meanwhile, defines strategy as “a pattern in a stream of

actions” and states that strategy is consistency in decisions over time. Nag et al. (2007, p. 944) further argue that a strategy “deals with the major intended and emergent initiatives taken by general managers on behalf of owners, involving utilization of resources, to enhance the performance of firms in their external environments.” These definitions emphasize the process of executing a strategy to improve the position of the firm compared to its competitors.

Considerably less scholarly attention has however been paid to defining the term digital transformation strategy. A search on the Web of Science platform using the search terms “digital transformation strategy” and “digital transformation strategies” revealed that Matt et al.’s (2015) publication was the first on the subject. Matt et al. (2015, p. 339) argue that a digital transformation strategy “serves as a central concept to integrate the entire coordination, prioritization, and implementation of digital transformations within a firm.” The authors highlight the following three aspects that are affected by a firm’s digital transformation strategy: (1) the use of digital technologies, (2) changes in value creation, and (3) structural changes. First, the use of digital technologies reflects a firm’s ambition to use such technologies to create new products. Second, changes in value creation impact how the firm incorporates digital technologies into their core business to expand and enrich their current portfolio of products and services. This requires new competencies, new methods of monetizing from products and services, and alternative approaches to attracting new customers. Third, structural changes are mostly concerned with integrating digital practices, such as new digital product development procedures, within the firm. These digital practices could either be integrated into the existing business or be performed by a new, separate unit. The former would likely yield small overall changes, while the latter would likely produce substantial changes.

As argued by Matt et al. (2015), a digital transformation strategy helps firm managers understand how to perform the digital transformation and how the process evolves over time. Subsequent studies have followed Matt et al.’s (2015) point and studied the process of how firms are executing their digital transformation strategy, from initiation to implementation and finally performance and outcome measurement (Chanias & Hess, 2016; Chanias et al., 2019; Hess et al., 2016; Yeow et al., 2018). Building on the definition provided by Matt et al. (2015, p. 339) and this thesis’ definition of a digital transformation, I present the following definition of digital transformation strategy used in this thesis:

“A digital transformation strategy refers to how a firm performs a digital transformation, from initiation to implementation and finally, performance measurement.”



### 3. Conceptual framework

For this thesis, I developed a conceptual framework to describe the execution process of a digital transformation strategy. It builds on my definition of a digital transformation strategy presented in the previous chapter. The chapter sections address the dimensions of a digital transformation (Chapter 3.1), the digital transformation strategy implementation process (Chapter 3.2), as well as the outcomes and performance measurement of the digital transformation strategy (Chapter 3.3).

#### 3.1. Dimensions of a digital transformation

When pursuing a digital transformation, a firm's strategic intention is to deploy digital technologies to create new digital products and services, business models, and organizational setups that can generate additional value. How the firm intends to work with these three dimensions will affect the firm's strategic direction and provide guidelines for how to implement the digital transformation strategy, what digital technologies to use, and which customers to target, as well as clarify the value digital technologies could create for customers (Chanas & Hess, 2016). Digital technologies can process, analyze, store, move, and interpret data. By themselves, these technologies provide limited opportunities; however, when combined with other technologies, they can enable firms to develop new digital products and services (Porter & Heppelmann, 2014).

##### 3.1.1. Digital technologies for new products and services

Firms engaging in a digital transformation intend to transform their existing non-digital product and service portfolio by developing new digital products and services. Porter and Heppelmann (2014) state that a smart and connected product (hereafter, "digital product") combines digital technologies used for data collection, processing, analysis, and transfer, which are attached to or integrated into hardware. Porter and Heppelmann (2014) specifically emphasize three core elements of a digital product. First are the physical components, which are the mechanical and electrical parts that make up the physical structure of the digital product and enable it to function properly. Second are the smart components, which consist of sensors, processors, and software programs that enable data collection, processing, and analysis. The smart components allow the digital product to generate valuable insights that can unlock new functionality and enhance performance. Third, the digital product has connectivity components, such as ports and antennas, which enable both wired and wireless data transfer. Connectivity allows the digital product to communicate with either another device, such as a diagnostic tool, or other similar digital products. It can also enable a digital product to communicate with a platform incorporating a large number of digital products.

During the design process, a product's level of complexity is determined by the type of digital technology used (Porter & Heppelmann, 2015). For instance, a basic-level digital product is an existing product with an added sensor or connectivity technology that facilitates basic data collection. A medium-level digital product is an existing product with data processing and analysis technologies that offer suggestions on how to use the product more efficiently in addition to the basic-level sensors and connectivity technologies. That is, a medium-level digital product not only sends and displays basic data but also uses this data to assess its status

and performance. A medium-level digital product, therefore, possesses new functionality compared to a basic-level digital product (Porter & Heppelmann, 2015). First, medium-level digital products can monitor their status and alert the user to potential issues. This allows firms to provide remote services, and the product's user can receive status updates and suggestions regarding necessary maintenance. Second, the medium-level digital products can be controlled remotely and adapt to specific conditions and user needs. Third, the medium-level digital products can optimize uptime and utilization by combining multiple data sources from other digital products. Lastly, these three functionalities enable medium-level digital products to achieve autonomy as they learn about their environments and how to adapt to it (Porter & Heppelmann, 2015).

The previous two paragraphs described basic- and medium-level digital products, i.e., existing products with added digital technologies. However, a digitally transforming firm can also diversify and create entirely new products and services with limited connections to its current offerings (Aversa & Hueller, 2023; Bharadwaj et al., 2013; Menz et al., 2021; Verhoef et al., 2021), which are referred to as advanced-level digital products and services. An advanced-level digital product or service could, for instance, be a newly developed product enhanced with machine learning abilities or a service based purely on machine learning without a physical product.

These digital products and services create new opportunities for established firms. The connectivity of digital products enables firms to continuously send updates and provide upgrades that enhance product performance and reliability without having to change the product's core design (Porter & Heppelmann, 2015). This could potentially extend the lifecycle of product generations and decrease the need for firms to develop next-generation products. Additionally, digital platforms enable firms to sell their products as a service (Porter & Heppelmann, 2015; Verhoef et al., 2021; Vial, 2019; Warner & Wäger, 2019), which can increase the revenue generated by each product and reduce fluctuations of revenues. Further, digital platforms enable firms to protect their existing market and expand into others (Aversa & Hueller, 2023; Menz et al., 2021).

### 3.1.2. Digital business models

Teece (2010) states that the core function of a business model is to articulate how the firm creates value for customers, captures that value, and transforms it into profit. Value creation refers to how a firm—either independently or with external partners—generates value for its customers (Klos et al., 2021). Digital technologies have enabled firms to better interact with customers and understand what features create value for them (Klos et al., 2021; Porter & Heppelmann, 2015). Value capture is concerned with how firms seize sufficient revenue to cover product and service development costs (Klos et al., 2021).

Porter and Heppelmann (2015) explain that the traditional business model of established firms involves selling the ownership of the product to the customer via a one-time transaction. The firm charges the customer based on how much it costs to develop, manufacture, distribute, and advertise the product. The customer then purchases the product through a retailer and is then responsible for maintaining and operating it (Agarwal, 2022; Simonsson, 2021). However, according to a service business model, the firm retains ownership of the product and instead

sells access to it, and the customer pays for how much they use the product. This requires the firm to maintain the product, and a digital product's sensors and connectivity functions increase uptime and reduce servicing costs. Such improvements can reduce the firm's costs of owning the product and potentially increase product profitability (Porter & Heppelmann, 2015).

The degree of business model change is governed by the level of complexity of the digital product (Frank et al., 2019; Warner & Wäger, 2019). A basic- and medium-level digital product or service will likely benefit from a traditional business model, as the added value such products can provide to its customers is relatively limited. An advanced-level digital product or service on the other hand can offer customers with high levels of added value and therefore provide firms with opportunities for creating entirely new models (Frank et al., 2019). While this is also true for digital products and services, the introduction of novel digital business models could attract new customers to the firm. Models such as pay-per-use and pay-per-hour could entice new customers who, for example, want to reduce their capital investments in machines by renting rather than buying.

### 3.1.3. Organizational setup

Smith and Beretta (2021) argue that the existing organizational setups of established firms might not support the development of new digital products and services or new business models. Singh et al. (2020) discuss two main design parameters affecting the organizational setup of firms undergoing a digital transformation. The first design parameter relates to the firm's vertical coordination, that is, whether the firm's structure emphasize centralization or decentralization. In a multi-business firm, a centralized structure delegates decision-making authority to a corporate unit, which makes the decisions for all business units and departments. A decentralized structure enables the business units and departments to make their own decisions in matters related to their work. Verhoef et al. (2021) argue that separate and autonomous business units can respond more rapidly than a centralized corporate unit. A decentralized structure is therefore argued to be more appropriate for experimenting with digital technologies, and it is less affected by the potential constraints imposed by the corporate unit (Verhoef et al., 2021). Mustafa et al. (2022) further argue that decentralization improves information flows, which results in an improved ability to identify market opportunities and develop suitable products. It also enables firms to increase innovativeness and flexibility, leading to an improved ability to respond to rapidly changing markets and technologies (Hanelt et al., 2021).

The second design parameter discussed by Singh et al. (2020) is horizontal coordination, which relates to cross-department collaboration and information sharing. Established firms often divide their organizations into several functional departments, such as R&D, marketing, and IT, which act autonomously (Porter & Heppelmann, 2015). However, as with all attempts at innovation, a digital transformation emphasizes the need for cross-functional collaboration and the combination of expertise to deliver digital products and business models. For instance, successfully developing a digital product requires both an R&D department's skills in designing and integrating mechanical and electronic components and an IT department's skills in software development and data management (Porter & Heppelmann, 2015). Svahn et al. (2017) similarly emphasize the need for the firm to enhance communication between

departments, break down barriers between functional departments, and facilitate interactions between employees with different skills. This could potentially lead to employees thinking more creatively and generating innovative ideas, eventually resulting in new products and services.

Porter and Heppelmann (2015) argue that corporate units within multi-business firms play a key role in the digital transformation. Recent research has highlighted that corporate units can support digital transformation strategies in multiple ways (Porter & Heppelmann, 2015), such as by establishing a detached unit that can finance and drive the development of new digital products, services, and business models (Mustafa et al., 2022; Smith & Beretta, 2021; Vial, 2019). This structure enables a detached unit of a digitally transforming firm, which is referred to as an innovation or digital lab (Warner & Wäger, 2019), to dedicate itself to radical digital innovation and quickly respond to new digital opportunities. Other units within the firm can work on continuing to deliver similar non-digital products as before. This setup allows the firm to continue its current product development processes while developing new digital products and services in the detached digital innovation lab.

The ability to simultaneously develop both traditional and new digital products and services is a necessity for digitally transforming firms (Porter & Heppelmann, 2015; Smith & Beretta, 2021). There will be a time, during the shift from traditional products and services to new digital equivalents, when both traditional and new products and services co-exist. This also applies to traditional and digital business models, as well as organizational setups designed for both non-digital and digital product and service development. In this context, Porter and Heppelmann (2015) argue that the transformation will be evolutionary rather than revolutionary and that firms must adopt a hybrid or transitional organizational setup.

### 3.2. The implementation of a digital transformation strategy

The firm's intentions with the three dimensions described above guide the implementation of the digital transformation strategy. Sebastian et al. (2020) however reported that established firms find it considerably easier to formulate a digital transformation strategy than to realize it. Mintzberg and Waters (1985) argue that firms need to constantly reformulate their strategic intentions and occasionally, develop entirely new strategies to compensate for the inadequacies of the strategic intentions.

Mintzberg (1978) makes the distinction between intended and emergent strategies. Intended strategies are planned actions that are most often implemented by top-level managers in the organization hierarchy who set guidelines for how the firm should act. Such strategic decisions could include which products to develop, which markets to operate in, and which customers to target (Mirabeau & Maguire, 2014). In the digital transformation context, Chanas and Hess (2016) have studied the digital transformation strategies of three European automotive manufacturers and explained how top management decided what kind of digital products and services to develop and what new business models to adopt. Top management also created new organizational setups with cross-functional teams to aid with the firms' respective digital transformation. However, purely intended strategic actions are almost always insufficient for realizing digital transformation strategy (Chanas & Hess, 2016). This suggests that firms must

develop strategies that are in line with Mintzberg's (1978) second type of strategy, namely emergent strategies. These strategies arise from unplanned actions in response to an inadequate intended strategy or disruptions to the environment (Mintzberg & Waters, 1985). Mirabeau and Maguire (2014) argue that middle managers leverage knowledge gained from previous experiences to explore new opportunities for developing emergent strategies. Furthermore, in the digital transformation context, Chanas and Hess (2016) found that some of their studied firms' departments anticipated the importance of digital technologies for the future of the automobile industry and integrated digital technologies in products and processes before a digital transformation strategy was implemented.

The above exposition treats strategy as a process. The process perspective describes strategy as "a sequence of events that describe how things change over time" on the overall firm level (Van de Ven, 1992, p. 169). Langley et al. (2013, p. 1) state that process studies "address questions about how and why things emerge, develop, grow, or terminate over time." Mirabeau and Maguire (2014) further highlights the importance of managers and their actions, as strategy is also socially constructed by individuals acting and interacting within a specific context (Jarzabkowski, 2004). These individuals, also referred to as "strategy practitioners," act strategically based on the different roles they hold, the resources they control, and the know-how they possess (Burgelman et al., 2018). Researchers have recently highlighted the usefulness of understanding the strategy process from the perspectives of strategy practitioners (Burgelman et al., 2018; Chanas et al., 2019; Mirabeau & Maguire, 2014; Mirabeau et al., 2018) because "the overarching goal of both the strategy process and practice areas is similar; that is to study the strategic events and activities in organizations" (Paroutis & Pettigrew, 2007, p. 101). Burgelman et al. (2018) argue that the strategy process is shaped by practitioners who respond to obstacles that hamper strategy realization. In the digital transformation context, such obstacles could be the emergence of new digital technologies or disruptive competition, which forces practitioners to reevaluate their emergent strategic responses. These responses then shape and redirect the strategy process.

The traditional view of the strategy process conceptualizes it as a linear process with a clear beginning and end (also referred to as "strategy as plan" in (Mintzberg, 1987)); however, as previously mentioned, firms need to constantly adapt and reevaluate their strategies to realize them (Langley et al., 2013; Van de Ven, 1992). Cloutier and Langley (2020) specifically emphasized four types of processes: linear, parallel, recursive, and conjunctive process. Linear and parallel processes have clear beginning and end points and progress from one stage to the next. The recursive view emphasizes cyclical and evolutionary modes of seeing a process, and the conjunctive view argues that to theorize about processes, one must combine elements of the process, which are usually studied in separation. As recent research has emphasized, a digital transformation is a highly dynamic process that requires the constant evaluation and reevaluation of the digital transformation strategy (Björkdahl, 2020; Chanas et al., 2019; Vial, 2019; Yeow et al., 2018). Therefore, several iterations of a digital transformation strategy might be required before measurable outcomes are achieved.

### 3.3. Digital transformation strategy outcomes and measurements

The outcomes of a digital transformation strategy are most often the combination of intended and emergent strategies, and some strategies are realized while others are not (Mintzberg, 1978). Following Mintzberg and Waters (1985), Chanas and Hess (2016, p. 3) define a realized digital transformation strategy as “the result of a pattern in a stream of actions,” where the pattern in a stream of actions refers to the digital transformation. Their definition emphasizes the process of combining intended and emergent strategic responses to realize a digital transformation strategy. Combining the view of Chanas and Hess (2016) with the definition of digital transformation strategy used in this thesis suggests that the realization of a digital transformation strategy is dependent on how a firm performs the digital transformation, from its initial objectives to implementation and finally performance measurement. According to this thesis’s definition of a digital transformation, a realized digital transformation strategy enables a firm to change how they deploy digital technologies; it also enables them to develop new digital products and services and digital business models and make organizational setup changes with the aim of reaching new markets and customers to generate and appropriate additional value. A realized strategy is, therefore, a strategy that the firm sustains because it perceives the strategy as providing some measurable benefits. If such a strategy is successful or not is outside the scope of this thesis (however, it is discussed briefly in Chapter 7.2).

A digital transformation is intended to generate and appropriate additional value for a firm. Value, in this context, can be a combination of both tangible assets, such as increased profits, and less tangible aspects. Assessing the latter requires new methods of measuring value (Kaplan & Norton, 1992). Traditional performance measurements focus on the creation of physical capital, and firms might establish key performance indicators (KPIs) around factors such as productivity, production utilization, inventory stocks, Return On investments (ROI), and revenue (Libert et al., 2016; Verhoef et al., 2021). While these are still relevant for digitally transforming firms, as firms still need to create value for their owners and shareholders, traditional KPIs also present certain problems. Schräge et al. (2022) argue that traditional KPIs address the short-term financial goals, but such KPIs hamper the firm’s ability to realize its digital transformation strategy. Instead, a digital transformation requires firms to invest in new abilities and technologies, which may not yield an immediate ROI. However, as managers need to reach the target KPIs, investments in a digital transformation might be perceived as less of a priority.

In this context, existing research on digital transformations has argued for new and softer KPIs and performance measurements, such as those related to customer engagement, learning, and branding (Libert et al., 2016; Verhoef et al., 2021). First, Warner and Wäger (2019) and Verhoef et al. (2021) expressed that born-digital firms often prioritize value creation over value capture and prioritize attracting users over generating profit. A newly developed digital platform, for instance, might not provide enough value for potential customers to be willing to pay. However, by attracting a large number of users on a digital platform, a firm can collect data from users, which can be used to improve the platform, eventually influencing users to pay for access. Engaging customers and understanding their needs and behaviors are, therefore, important activities that established firms should consider (Sebastian et al., 2020; Verhoef et al., 2021). Second, the implementation of a digital transformation strategy is a highly dynamic

process (see chapter 3.2), and continuous learning enables strategy realization (c.f., Chanias et al., 2019; Yeow et al., 2018). Employees must enhance their competencies and skills to develop new digital products, and therefore, it is important to track what kinds of competencies are needed and enable employees to develop their competencies accordingly. Third, an enhanced brand identity and improved firm image can be a useful measurement of the performance of a firm's digital transformation. As noted by (Chanias et al., 2019), a firm can profit from showing customers its clear intention to use digital technologies to enhance its offerings. This could lead them to be perceived as innovative and customer-oriented by both competitors and customers, highlighting the importance of identifying ways of measuring such aspects.



## 4. Methodological approach

This chapter begins with a discussion of my stance on conducting research on organizations. Next, I explain the background of this thesis before explaining the research design. The chapter ends with some reflections on the methodological approach.

### 4.1. Conducting research on organizations

As someone with a background in mechanical engineering and a life-long interest in science and technology, I first assumed that organizations were entities consisting of structures, rules, and processes to which employees had to conform. However, as I conducted literature reviews, preliminary interviews, and studied the fundamental principles of research methodology, I began to see organizations differently. It became clear to me that organizations are not as rigid and objective of entities as I first assumed; rather, they are social constructions shaped by the actions of their employees and stakeholders. Chatting with managers during my first study opened my eyes to an interesting phenomenon. Although employees followed long-established routines and processes, there was a surprising amount of flexibility and a willingness to experiment and forge new pathways that were more compatible with the evolving digital landscape. The managers pointed out examples where top management wanted to suspend both smaller projects and larger programs that they did not consider appropriate for the firm's current business objectives. However, middle managers and other employees found their projects or programs to be too interesting to suspend and, therefore, continued developing them without the knowledge of top management while continuing with their regular product development duties. Later, after having invested more time and effort into these projects and programs, top management started to recognize their potential and gave them their support. In numerous instances, these projects and programs eventually became products and services which the firms launched. This illustrates the significant role individuals' knowledge and strategic responses can play in the execution of the digital transformation strategy. Further, I noticed that employees working in the same business unit or even department has different views on the status of the digital transformation. While some stated that there are a lot of things happening and that the firm has made significant progress, others stated that the implementation of digital transformation initiatives has been slow, and that little progress has been made. This could partly be explained by the lack of a clear and objective definition of the term *digital transformation*, as discussed in Chapter 2. Indeed, this lack of clarity can cause managers and other employees to have different perceptions on the progress of the digital transformation and its outcomes. Divergent views on the digital transformation progress may also be due to employees being unevenly involved in the digital transformation, with some working with it every day and others focused mostly on the current business. This point emphasizes that I, as a researcher, must consider the interviewees' answers not as binary true or false statements but rather as ways of describing the same phenomena from different angles.

Guided by these insights, I do not consider data to be facts that describe an objective reality. Rather, I, as a researcher, construct a conceptual reality by interpreting people's descriptions of their perceived reality. This approach correlates with the ontological view of constructivism and the epistemological view of interpretivism while also incorporating aspects of postmodern

thought (Bell et al., 2019). Although I do not uncritically ascribe to all of these theoretical approaches, they have helped to guide me to how I understand reality in my research.

## 4.2. Thesis background

This PhD project has been a mix of freedom to choose my own topic of interest as well as strict limitations. When I started my PhD journey, I received financial support through an ongoing project on digital transformations in mature industries (see Study 1 in Figure 1). This project received funding from the Swedish Governmental Agency for Innovation (Vinnova), and the project intended to study new business models, organizational innovation, and ecosystems within digitally transforming firms. The project included two established manufacturing firms in Sweden that desired to increase their digital presence.

The research target for this thesis is therefore established manufacturing firms in Sweden. There are two main reasons to study such firms. First, the research funding financing this thesis focuses on established Swedish manufacturing firms' digital transformations. Receiving this funding therefore considerably narrowed the scope of this research. However, while this narrow scope limited my options regarding what I could study, it also produced several interesting conditions. Sweden has a long history of successful manufacturing firms, such as SKF, Husqvarna, Electrolux, Volvo, Ericsson, and Scania. These firms still hold a strong market presence and are among the market leaders in their respective industries. However, as they have built a lot of their current abilities via incremental innovation and production efficiency, the introduction of digital technologies poses considerable challenges for these firms. Second, in addition to containing a significant number of established firms for its size, Sweden also ranks as one of the most innovative countries in the world (WIPO, 2022). Swedish firms show great ability to create new knowledge and produce innovative technology outputs. However, research also shows that Swedish firms struggle to innovate with digital technologies (Björkdahl, 2020; Björkdahl et al., 2018). Therefore, this discrepancy warrants further study.

Against this backdrop, I explored interesting research pathways for my PhD thesis, such as digital ecosystems, digital capability building, and digital business models. Simultaneously, I conducted interviews with managers at several firms and small and midsize enterprises in Sweden. These efforts not only provided valuable data for future papers but also aided in refining the focus of the thesis. Ultimately, I felt that strategic management in the digital transformation context, and specifically the digital transformation strategy process, was a promising research topic. I then devised research questions partly based on existing gaps in the literature and partly on the data from the interviews. Answering these research questions will increase the scholarly understanding of how digital transformation strategies are executed and realized within established Swedish manufacturing firms.

Next, Study 2 built on the insights gained from Study 1 and was initiated in the middle of 2021. Study 2 was funded by a Vinnova-financed project that specifically examined how Swedish firms realize digital transformation strategies. This study eventually became Paper 2. More details on the papers are found in the subsequent chapter.

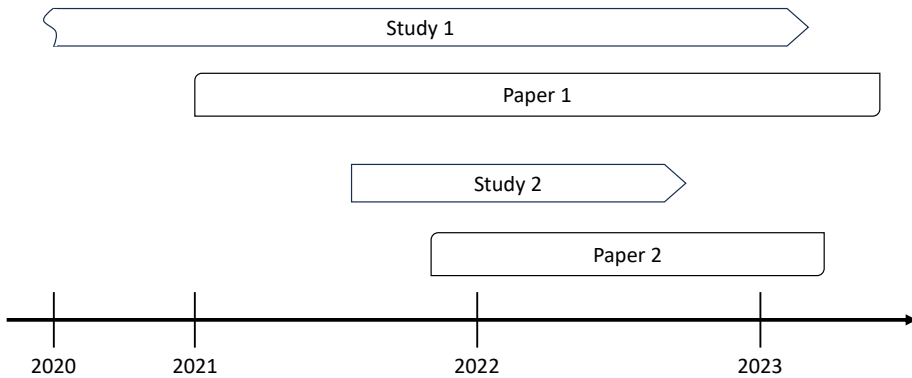


Figure 1: Research process.

### 4.3. Research design

A suitable research design is critical to answering the research questions posed in this thesis (Merriam & Tisdell, 2016). For this purpose, this section will describe the critical aspects of studying a process, including case selection and sampling, data collection, and data analysis.

#### 4.3.1. Studying a process

The research questions focus on how digital transformation strategies are executed within established firms and why some are realized, and others are not. Both research questions are related to the process perspective of digital transformation strategies. Langley et al. (2013) emphasize the centrality of time when conducting process studies, and Cloutier and Langley (2020, p. 3) argue that “process theory address questions about how and why things emerge, develop, grow, or terminate over time.” Langley et al. (2013) highlight that process studies benefit from the combination of several data sources, such as interviews and documents, as well as longitudinal data collection.

The execution of a digital transformation strategy at an established firm requires its managers to constantly evaluate new digital technologies (Sebastian et al., 2020) and deal with high levels of uncertainty (Vial, 2019). New ways of using digital technologies are constantly explored, and it is difficult, if not impossible, to predict which technologies will ultimately be successful (Yoo et al., 2010). This suggests that studying digital transformation strategies requires an adaptable and dynamic research design that enables the researcher to respond quickly to changes. Furthermore, since executing a digital transformation strategy is a time-consuming process that involves extensive experimentation and learning (Chanias et al., 2019; Warner & Wäger, 2019), the research designs of both studies needed to allow for the continual collection of both contemporary and historical data regarding decisions and initiatives.

A qualitative case study, therefore, emerged as a suitable methodological approach for both studies. It allows for studying “a contemporary set of events over which a researcher has little or no control” (Yin, 2018, p. 13), and it is well-suited in instances where it is difficult—if not impossible—to separate the case from the context. As previous research has shown (Chanias

& Hess, 2016; Chanas et al., 2019; Warner & Wäger, 2019), the execution of a digital transformation strategy is context-specific and it evolves differently in every firm. Because “case studies emphasize the rich, real-world context in which the phenomena occur” (Eisenhardt & Graebner, 2007, p. 25), they enable for studying the execution process of digital transformation strategies in their natural context.

#### 4.3.2. Case selection and sampling

A single-case study allows the researcher to study one case in depth (Siggelkow, 2007). Complimenting single-case studies, multiple-case studies allow the researcher to not only understand each case but also to compare two or more cases and identify their similarities and differences (Bell et al., 2019). Study 1 was an embedded longitudinal single-case study, whereas Study 2 was a multiple-case study. These two case studies have illuminated the process of executing a digital transformation strategy and the difference between two firms’ digital transformation strategies.

Purposeful sampling (Bell et al., 2019) is used to (1) choose specific cases that are relevant to the phenomenon of interest and (2) are appropriate for answering the research question(s). In Study 1, the studied firm should, at least to some extent, be involved in a digital transformation and have a corresponding strategy guiding it. The chosen firm, Firm South, had shown intentions of engaging in digital transformation activities since around 2010, making it suitable for studying the process of executing a digital transformation strategy. Further, as Firm South was comprised of a corporate unit and three business units (two of them were included in the study), an embedded longitudinal single-case study research design was chosen. This embedded case study allows the researcher to study a single case and its context while employing different units of analysis (Yin, 2018).

Study 2 used four case selection criteria to select digital programs within two established firms, namely Firm South and Firm North. First, the firms had to be intending to develop new or existing products and services that include digital technologies for new or existing markets within the programs. Second, the firm had to have at least one manager whom we could interview who was or had been involved in the program and who had expert knowledge of its execution. Third, the program needed to have been active for at least three years, which would have allowed it to establish itself and become more mature. Fourth, the programs needed to have reached a stage of conclusion, meaning it would be possible for us to assess whether the program(s) had been realized or not. Study 2 targeted six programs—Alpha and Beta from Firm North and Gamma, Delta, and Epsilon A and B from Firm South—involving digital product and service development. Each of these programs became one case to enable for studying them separately and then comparing them.

#### 4.3.3. Data collection

A combination of conducting interviews and collecting document data was used in both studies; however, the main data collection method was interviews (Bell et al., 2019; Yin, 2018). While there are other methods for collecting primary data, such as observations, interviews were chosen for two main reasons. First, interviews offer easy entry into firms and require limited time and resource investments from both the firm and the researcher. This made it possible to

broaden the interviewee sample and obtain more perspectives compared to other data collection methods, such as observations. Second, as the data collection was carried out following the implementation of COVID-19 pandemic restrictions, it was impossible to conduct in-person observations of the studied firms. To capture individuals' perspectives on both historical and contemporary events (Merriam & Tisdell, 2016), we adopted a semi-structured interview approach. This allowed for asking questions from a pre-written interview guide related to each study's aim, but also for asking follow-up questions on interesting adjacent topics. The flexibility of the semi-structured interview further supports the researcher's understanding of the firm and its context (Bell et al., 2019; Merriam & Tisdell, 2016).

Study 1 was the result of an active research project that had been ongoing since 2017. Data was mostly collected via four rounds of semi-structured interviews. The first round<sup>1</sup> was conducted between August 2019 and August 2020. During this first round, employees from Firm South's Corporate unit and Business units H and C were interviewed (see Appendix A for interviewee list); some interviews were conducted in-person while others were done online due to COVID-19 restrictions. The questions focused on the firm's overall digital transformation, potential collaborations with other external actors, and the results of the firm's digital transformation (see Appendix B for the interview guide). Two of the researchers, one of whom was employed at the studied firm, conducted the interviews. The second round of interviews was conducted between May and June of 2021 and included seven former and two new interviewees. All interviews during the second-, third-, and fourth round were conducted online. The interview questions were similar to those asked during the first round, with slight modifications. Specifically, questions regarding how things had changed over the last 1,5 years since the last interview were asked to the seven former interviewees. Three researchers, one of who was employed at the studied firm, conducted the interviews. The third round of interviews included two former and four new interviewees and was conducted between October and November of 2021. The same three researchers as in the second round conducted the interviews, and they asked the same type of questions as in the second round. The fourth round of interviews was done in October of 2022 and March-April of 2023. This round included three interviewees, one of who was new and was interviewed twice. This fourth round focused on evaluating the previous results and validating the findings. The same three researchers as in the second and third round conducted the interviews. In total, 30 interviews were conducted with 18 employees at Firm South.

However, while interviews are time-efficient and provide in-depth data, they are sometimes seen as inaccurate, and that some data is more easily accessible from other sources. Therefore, the interview data was combined with document data, primarily from annual reports. Annual reports were used to obtain data on specific historical events that interviewees may have forgotten and to verify interviewees' statements. The annual reports also provided a brief contextual description of the firm, which was useful for understanding it better.

The second study was initiated in response to the findings from the first study. Some interviewees mentioned two programs that had attracted interest from multiple units within Firm South. The data collection for Study 2 included two interview rounds and the first round

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<sup>1</sup> I was not part of this first round of interviews as it was conducted before I started my PhD.

began with interviewing four employees about these two programs in September and October 2021 (see Appendix C for interviewee list). Three of the researchers involved in the project, one of who was employed at the studied firm, conducted the interviews. After the initial conceptualization phase, the data collection efforts expanded, and the second round included middle managers, product owners, and vice presidents of other active and suspended programs within Firm South and Firm North, similar to the first two programs. This second round of interviews was conducted between September and November of 2022 and included five interviewees with deep knowledge of five programs, four of them selected for the study. Four of the interviews were included in the study, and one was a complementary description of Firm North. Questions focused on the programs' progress and process, how the programs had emerged, what had happened along the way, and what outcomes the programs had achieved (see Appendix D for interview guide). In total, nine interviews were conducted with nine employees at Firms South and North. Secondary data, such as annual reports, official websites, and product demonstrations, were used to complement the historical interview data where needed.

Returning to Langley et al.'s (2013) point on the centrality of time in process studies, each of the two studies addressed the time aspect differently. The data collection process in Study 1 focused on probing the three units at different points in time to identify how the digital transformation strategy execution process had evolved and how Firm South and its associated business units had responded to the transformation. Contrastingly, Study 2 targeted digital programs that could indicate whether their results had been realized, partly realized, or unrealized. The objective, therefore, was to identify historical events that shaped the programs and affected their outcomes. This approach then provided a description of how the programs evolved over time (c.f., Van de Ven, 1992).

#### 4.3.4. Data analysis

Both studies followed the pattern of "within-case and cross-case analysis," as discussed by Eisenhardt (1989, p. 533). This meant that the cases (in Study 1, despite not being labeled as cases, the Corporate unit and Business unit H and C) were first analyzed individually to identify relevant aspects that could help answer the studies' research questions. The data analysis for both studies followed a similar pattern and was conducted in several stages.

For Study 1, the data analysis was conducted in four stages. The first stage<sup>2</sup> involved three of the four researchers, one of who was employed at the studied firm, and included reading the interview transcripts, drafting preliminary notes, and coding based on the readings. These notes included comments on the firm's and unit's intentions regarding the use of digital technologies, how they worked with implementing these intentions, and how they measured the outcomes of this process. The three researchers conducted the workshop in 2019 to discuss aspects identified in the transcripts. The researchers compared notes during a workshop, resulting in a comprehensive list of codes related to the digital transformation strategy process. They mapped how digitalization efforts emerged and evolved, what initial activities were performed, and potential opportunities and challenges in the early phases of the digital transformation. This

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<sup>2</sup> I was not part of the first and second stage of data analysis as they were conducted before I started my PhD.

mapping provided an overview of the intended digital transformation strategy, its implementation, its reformulation, and outcomes. The second stage involved a workshop that included me and two of the other researchers, one of whom was employed at the studied firm. This round was conducted in 2020 and involved merging similar and converging aspects into overall codes. For example, activities related to data management, connectivity, and sensor integration were coded as digital products and services. Other activities, such as new sales channels, were coded as business models, and the establishment of new departments was coded as organizational setup changes. The third round, which was also conducted in 2020, was a workshop involving two of the researchers that focused on identifying mechanisms that assist in the realization of digital transformation strategies. Specifically, this workshop focused on how employees explain their work related to incorporating digital technologies into products and services, what knowledge was needed to do this, and what kind of tactics managers used to advance digital technologies. We reviewed the interview transcripts, created mind maps, and identified three main dimensions of the digital transformation: digital products and services, digital business models, and new organizational setups. These dimensions eventually became the core concepts for Paper 1. Lastly, the fourth round of data analysis, conducted in 2023, involved two of the researchers and was a workshop where we merged knowledge gained from the three previous stages to create an overall process view with three distinct phases and specify the details of each phase. The data from the final round of interviews were particularly important here, as the data validated our previous findings.

In Study 2, the first of the three analysis rounds involved within-case analysis and started with all participating researchers reading the interview transcripts and independently writing down preliminary codes. These codes focused on identifying motivations for initiating the programs, clarifying the technologies used and targeted customers, and recognizing what challenges the program teams faced during the development. All of the researchers, one employed at Firm South and the other at Firm North, participated in a workshop and discussed the cases individually to determine which aspects of the programs were the most relevant for the study. During this workshop, the cases were categorized as either related, semi-related, or unrelated digital diversification programs based on their connection to existing products and markets. For example, a program with strong connections to existing products and markets was categorized as a related digital diversification, and a program with weak connections was categorized as an unrelated digital diversification. Two programs displayed both strong and weak connections and were, therefore, categorized as semi-related digital diversifications. Further, the programs were also categorized as either realized, partly realized, or unrealized based on their outcomes. The second round concerned cross-case analysis and involved all four researchers comparing cases. All researchers individually compared cases with similar levels of relatedness to identify similarities and differences, and compared realized and unrealized programs to identify aspects that affected their realization. All researchers then attended a workshop to share their insights and agree on a collective understanding. The third round involved verifying the analysis with industry experts (in two rounds) and managers at one of the studied firms.

For this thesis, one main alteration in the methodological approach was made that deviated from the approach used in existing studies and subsequent papers. The classification of the

related, semi-related, and unrelated digital diversification programs in Study 2 has been slightly adjusted. This was done partly to simplify the terminology but primarily to make it easier to compare the programs with Study 1. As the related digital diversification programs were built around developing products that shared technology with the firm's current products and only used basic-level digital technologies, these products will be referred to as basic-level digital products (and services) in this thesis. This also applies to the semi-related and unrelated digital diversification programs, which are referred to as medium-level digital products and services and advanced-level digital products and services, respectively.

#### 4.4. Reflections on the methodological approach

Naturally, while certain methodologies might hold a higher degree of suitability for studying firms, it is essential to remember that there is no single, flawless approach.

As expressed by Bell et al. (2019, p. 46), "Validity is concerned with the integrity of conclusions that are generated from a piece of research." Validity therefore relates to how credible findings from a study seem to be from a reader's perspective (Merriam & Tisdell, 2016). Several precautions were taken to increase the validity of the data collection and analysis processes. Most interviews were conducted with at least two, and sometimes three of the researchers. The interviews conducted by only one of the researchers were done in the later stages of data collection when the interview guide had been properly tested and verified. This ensured that important topics raised by the interviewees were identified and further explored. Additionally, the study not only relied on multiple data sources and included a variety of managers and their perspectives, but the interviews were also validated by secondary sources such as annual reports. Further, workshops were organized with the researchers involved in the two studies. We also attended workshops with colleagues, presented conference papers, and organized a workshop with fellow researchers. We also held numerous online video discussions and had the study results verified by firm representatives, which enabled us to generate more precise and accurate findings. All of these activities have helped to increase the validity of the research.

As mentioned, both studies included in this thesis utilized some public documents published by the studied firms. Although one may assume that public documents, such as annual reports, are objective and factual representations of firms' activities, Bergeck et al. (2008) emphasize potential issues. It is essential to consider who decides the report's content, what message that person wants to spread, why that message is being spread, and who the report is targeting. The annual reports' focus is to provide general information about the firm and specific financial results. The annual reports do not go into detail about specific products or services, nor do they include information that the firm does not want to make public. Further, the content, as well as the products and services that the firm wants to promote in its annual reports, might change rapidly from one year to another. As shown in Study 1, the annual reports clearly emphasized that Firm South was experimenting with sensors and connectivity and implementing more digital initiatives to ensure that digitalization is a key strategic activity. The annual reports are more accurate when discussing how the firm has evolved over time than in providing details on current work (Bergeck et al., 2008). In both studies, the annual reports provided

supplementary material for understanding how firms are executing their respective digital transformation strategy.

The purposeful sampling approach allowed me to choose cases that fit the research aim, and the qualitative case study design enabled me to study a selection of cases in depth. However, this also limited the generalizability of the results (c.f., Bell et al., 2019). Firms are highly context-dependent and have constructed their own processes for dealing with the digital transformation, and therefore, the results from the two studies presented here are not directly generalizable to other similar firms. However, although they do not provide statistical generalizability, the studies in this thesis have focused on providing thick descriptions of the firms and cases, which would enable other researchers to make use of the studies' findings in other contexts.

Moreover, the COVID-19 pandemic made it impossible to conduct in-person field studies at the firms. Indeed, all but two interviews were conducted via the video conferencing platforms Zoom and Teams. During the second study, two interviews were conducted in person following the lifting of COVID-19 restrictions (see Appendix C). As explained earlier, while interviews provide time-efficient access to data compared to more active methods, such as participant and non-participant observations, they sometimes fail to provide in-depth and contextual understanding. To mitigate this risk, I strove to fully utilize the flexibility of the semi-structured interview approach and ask follow-up questions when certain things were unclear. Further, we maintained a collaborative relationship with two industrial PhDs who work at both firms, enabling interviews and discussing results. They also helped the studies to stay relevant to practitioners, as they emphasized the importance of producing useful research results.

However, including practitioners—in this instance industrial PhDs—in a study comes with both advantages and risks. When practitioners are involved in discussing the framing of the studies, writing the papers, and assisting with the analysis of the results, they can increase a study's validity and theoretical generalizability. Most important is their ability to identify interviewees that are suitable for providing the needed data for a study. However, while they benefit the research in many ways, they are also a cause for concern. For instance, their bias towards their own firms could affect the research; for example, they may purposefully avoid certain potential interviewees who may express a view different from their own. Bias has been reduced by validating findings, asking interviewees to provide suggestions for potential new interviewees, and, to some extent, by not revealing the firm's identity. This last point can help, as it disincentivizes the firm from hiding information.



## 5. Summary of papers

This chapter describes the two studied firms and the two papers appended to this thesis.

### 5.1. Firm descriptions

Both papers used empirical data collected from two Swedish manufacturing firms. Paper 1 used data from Firm South and its Corporate unit and Business units H and C. Paper 2 used data from Firm South and its Business units H and C, as well as data from Firm North (see Table 3).

Firm South has a long history of developing and manufacturing a wide range of mechanical products and has changed its product portfolio extensively over the years. Currently, Firm South consists of three business units; two of them are included in the papers. The business units operate in different industries, and their main offerings are products sold using traditional business models via retailers and direct sales. Business unit C's products are almost exclusively used by professionals, and the interviewees defined their customer segment as conservative in terms of their responses to radical innovations and digitalization. Business unit H's products are used by both professionals and private consumers, and interviewees defined their customers to be slightly less conservative than Business unit C's customers. The business units act autonomously but receive support from the Corporate unit when needed.

Firm North also has a long history of developing and manufacturing mechanical products. However, their product portfolio has remained relatively stable over the years, with the firm focusing on one core technology while broadening its application and market scope. Their products are sold exclusively to other manufacturing firms, mostly through direct sales but also via several retailers. According to the interviewees, Firm North's customers have a mixed attitude toward radical innovation and digitalization; some are progressive, and others are conservative.

Table 3: Appended papers and studied firms.

Paper	Level of analysis	Studied firm(s)	Answers research question
1	Business unit and corporate level	<ul style="list-style-type: none"> <li>• Firm South <ul style="list-style-type: none"> <li>○ Corporate unit <ul style="list-style-type: none"> <li>▪ Business unit H</li> <li>▪ Business unit C</li> </ul> </li> </ul> </li> </ul>	Mostly RQ1 and partly RQ2
2	Business unit and program level	<ul style="list-style-type: none"> <li>• Firm South <ul style="list-style-type: none"> <li>○ Business unit H</li> <li>○ Business unit C</li> </ul> </li> <li>• Firm North</li> </ul>	Partly RQ1 and mostly RQ2

## 5.2. Appended Paper 1. Co-evolution of Product, Business Model, and Organization in Digital Transformation Strategies: A Processual Approach

### 5.2.1. Paper outline

The paper was the result of a research project run at an established manufacturing firm (previously referred to as Study 1). After some preliminary interviews, it became apparent that the firm had released several products and services with added digital technologies but was struggling to adapt its business practices and organization to the increasingly digital environment. This was despite investments in organizational changes and attempts to access and create new revenue streams. A review of the existing literature revealed that most research focused on the positive aspects of digital transformations while routinely neglecting to consider the negative consequences. Therefore, the focus of the paper was to investigate how digital transformation strategies are realized within established firms and what elements support or hinder the strategy realization.

When performing a digital transformation, firms seek to use digital technologies, such as connectivity and sensors, and adapt their organization to enhance their current and future offerings. This suggests that firms need to build new abilities to enhance their skills in digital technology development, make their offerings more attractive by using new business models, and change their organizational setups. The scale of such a transformation implies that significant investments and resources must be allocated to certain strategic areas of the firms' digital transformation. The study employs the strategy process perspective, which views strategy as "a sequence of events describing change over time" (Van de Ven, 1992, p. 169). Interviews and follow-up interviews served as the main data sources and helped describe how several business units are executing Firm South's digital transformation strategy.

The paper's findings highlight three main phases of the digital transformation. During the first phase, between 2010 and 2016, the Corporate unit asserted that the business units should enhance their respective product portfolio by adding digitally enhanced products and digitally based services. The Corporate unit initiated a Connectivity hub, which brought together employees with competencies and interests in digitalization to define potential opportunities for utilizing digital technologies. Their knowledge was disseminated to the business units, which, with varying degrees of success, managed to develop new digital products for customers. However, the traditional business model of selling product ownership through an extensive network of retailers hampered service development. In the second phase, between 2017 and 2020, the Corporate unit established several digital transformation initiatives, including a new artificial intelligence (AI) lab, which was intended to nurture projects that could be beneficial for the business units in the future. During this phase, the Corporate unit also started decentralizing the digital transformation activities, with authority being delegated to business units. This meant that the business units enjoyed increased autonomy to manage the digital transformation. This shift led Business unit H to continue developing digital products and services and test new business models. Business unit C, meanwhile, struggled to maximize the potential of digital technologies. During the third phase, from 2021 onward, the units understood that they needed to scale up their digitalization activities and make them a

core part of their business. Managers tried to improve collaboration by reducing structural separation, scheduling new types of cross-functional meetings, and granting employees more freedom to experiment with new digital technologies.

The paper supports previous studies stating that firms try to realize their digital transformation strategy through a combination of intended and emergent activities. Because prerequisites are constantly changing and new digital technologies become available, firms must adapt their digital transformation strategy in order not to fall behind their competitors. This paper emphasized the importance of three digital transformation dimensions: (1) the development of new digital products, services, and solutions, (2) digital business models and (3) organizational setup changes. Further, these three activities created a misalignment between current and new ways of working. The previous way of working advocated for efficiency, incremental development, and limited external collaboration, whereas a digital transformation requires effectiveness, radical development, and extensive external collaboration. This means that the business units must rethink their previous organizational logic to comply with new demands.

### 5.2.2. Authorship

Paper 1 builds on an explorative study on the execution process of a digital transformation strategy by a corporate unit and its two business units at an established firm (Study 1). I co-wrote the paper with my supervisor, Solmaz Filiz Karabag (main author), Johan Simonsson, and Christian Berggren. Filiz and Johan initiated the paper, jointly conducted the first round of interviews, and devised the general theoretical framework for analysis. Johan arranged all the interviews. I took part in the second, third, and fourth rounds of interviews, transcribed them, and wrote the case description. Johan and Filiz then revised the case descriptions where needed. Filiz and I then jointly conducted the analysis and generated the general outline for the discussion. Johan later revised these where needed. Filiz and I then wrote the paper with help from Christian. The findings were then validated by several managers and employees at the studied firm. Christian and I presented the paper at the R&D Management Conference in Glasgow (online) on June 8, 2021, and I presented the paper at the ScAIEM PhD workshop in Copenhagen (online) on November 18, 2021. All four writers actively used the feedback we received from these sessions and further developed the paper to prepare it for publication.

## 5.3. Appended Paper 2. The Dynamics of Related and Unrelated Digital Diversification in Established Firms: Strategies, Execution, and Outcomes

### 5.3.1. Paper outline

What are the results of established firms' digital diversification strategies? How do established firms realize or fail to realize their digital diversification strategies? What factors contribute to the results of established firms' digital diversification strategies? These are the research questions the second paper sets out to answer. The paper included six strategic digital diversification programs that were selected as part of two Swedish manufacturing firms' respective digital transformation strategy. These programs enabled the study of the process of attempting to realize a digital diversification strategy.

A digital diversification strategy refers to a firm's motivation, intention, and ability to use digital technologies to diversify into new or existing markets using new or existing digital products and/or services. Firms can use digital technologies to enhance an existing product and deliver it to their existing customers. As such product offerings are related to the firm's current core business, it is defined as a related digital diversification. However, if the firms use digital technologies to develop an entirely new product intended for a new market, the product's relatedness decreases, and it becomes either a semi-related or unrelated digital diversification. Firms then realize digital diversification strategies through managers' actions during the entire process, from initiation to implementation and finally managing the outcomes. The manager's actions also shape the digital diversification strategy process, leading to both top-down strategy management and bottom-up strategy reorientation. A realized digital diversification strategy creates sustained and valued outcomes internally, such as capability building and knowledge creation, and other value for customers externally, such as useful products.

The findings suggest that established firms use digital diversification with various levels of relatedness, achieving different levels of realization. Out of the six strategic digital diversification programs included in the study, three were realized, two were partly realized, and one was unrealized. The findings highlight that an increased level of relatedness amplifies the need for defining a clear market gap and highlighting the customer benefits of a particular product or service. Firms engaging in related digital diversification, therefore, benefit from utilizing their understanding of current customers and providing a useful product or service to them. For the unrelated digital diversification programs, the correlation was inverted. A clear market gap and customer benefits led one program to become too focused on traditional performance measurements, such as profitability, and, in turn, the program neglected the need for an unrelated digital diversification program to sufficiently develop and mature.

Further, the findings highlighted four critical elements that contributed to the digital diversifications' realization or unrealized. First, market aspects suggest firms need to be aware of the market or customer segment they are targeting. Firms need to identify not only unmet market demand for a new type of product but also the potential of that market. Second, firms need to consider the technology they intend to use for their new product or service and determine how it relates to their current core technology. For related digital diversification, it is important for firms to maintain close connections between digital technologies and their core technology, as digital technologies are, in this case, used to enhance a current or new product. The paper's findings suggest that firms engaging in related digital diversification should focus on exploitation. Less relatedness meant programs had more freedom to explore and experiment with digital technologies with less clear connections to a firm's core technology and products. Third, managerial aspects highlighted that top management tended to be more involved in related digital diversification, and low- and middle-level managers were more involved in unrelated digital diversification. The autonomous strategic behavior of low and middle-level managers prioritizing their own development teams' interests and sustaining programs with limited interest from top management was a key contributing factor to the realization of one of the studied unrelated digital diversification programs. Fourth, program and project management execution elements affected the program team's ability to reconfigure existing abilities when the developed product or service did not appeal to customers. The related digital

diversification programs experienced more difficulties in reorienting abilities because their new product was more dependent on their core technology than the unrelated equivalents. These four elements contributed to a change in organizational logic from traditional to digital. Digital logic emphasizes agility, flexibility, and new performance measurements. It involves understanding the purpose of the product or service development, as related and unrelated digital diversifications require different approaches. Furthermore, digital logic emphasizes measuring customer engagement, customer experience, and branding alongside ROI.

The paper shows that established firms are able to realize both related and unrelated digital diversification strategies and that they do so through both support from top management and low and middle-level managers' autonomous strategic behaviors. The paper recommends that managers be proactive in the development of digital products and services and respond rapidly to changes.

### 5.3.2. Authorship

The idea for Paper 2 was derived from the interviews in Paper 1. During the interview process for Paper 1, we learned about a new program at Firm South. Subsequently, I began to work on Paper 2 and developed it further in collaboration with Solmaz Filiz Karabag, Johan Simonsson, and Girish Agarwal. Johan and Girish jointly arranged all interviews. I participated in all the interviews and transcribed them. All four authors developed the analytical framework during several workshops. My primary responsibility was writing the paper together with Filiz with help from both Johan and Girish, especially in writing the case descriptions and parts of the discussion. I presented the paper at the R&D Management Conference in Trento on July 11, 2022, and at a divisional workshop together with a few colleagues on December 8, 2022. I also worked on the paper as part of a course in academic writing during the spring of 2022. The paper was sent to a journal on April 25, 2023, and has returned with a major revision suggestion. The process of fixing the issues is under way and the paper will be sent back to the journal in mid-November 2023.



## 6. Analysis of main findings

This thesis aims to broaden the understanding of digital transformation strategies and answer how they are executed within established firms and why some digital transformation strategies are realized while others are not. This chapter will answer the two research questions of the thesis. Section 6.1 addresses research question 1, while Section 6.2 addresses research question 2.

### 6.1. The process of executing the digital transformation strategy

The first research question relates to this thesis' definitions of a digital transformation and a digital transformation strategy. A digital transformation is a change in how a firm deploys digital technologies to develop new digital products and services and digital business models, as well as make organizational setup changes with the aim of reaching new markets and customers and creating and appropriating more value for the firm. A digital transformation strategy is then the process of how a firm performs the digital transformation, from initiation to implementation and, finally, performance measurement. The findings from both appended papers described how the studied firms followed a strategy execution process that began with an intention to use digital technologies to create new digital products and services and evolved to include the use of digital business models and organizational setup changes. The firms also measured the outcomes and performance of the digital transformation strategy.

#### 6.1.1. Digital products and services

Both Papers 1 and 2 indicate that established firms' intended digital transformation strategy was to create digital products and services by enhancing their existing products with digital technologies. However, the degree of digital technology adoption and the level of ambition to develop digital products varied. With the basic-level digital products, the firms' intentions were to include sensors and connectivity to capture real-time data through various applications (see, for example, the Alpha and Beta programs in Paper 2). Such digitally enhanced products' purpose was to visualize usage patterns for customers and eventually enable the firm to provide digitally enhanced services (see the Delta program in Paper 2). Meanwhile, other examples exhibited the firms' intentions to develop medium-level digital products and services (see, for example, the Gamma program in Paper 2) and advanced-level digital services (see, for example, Epsilon A and B in Paper 2). These digital products and services were designed to not only collect valuable data for product insights but also facilitate intelligent decision-making through machine learning abilities.

The findings from both papers further reveal that firms frequently revise their digital product development intentions. As shown in Paper 1, Firm South's initial intentions focused on creating basic-level digital products with sensors and connectivity; over time, however, its managers' strategic response evolved to encompass more advanced-level digital products and services. As shown in Paper 2, this process eventually led to the development of the Epsilon programs, a service which used no physical product. This evolution was the result of extensive experimentation with connectivity and other digital technologies.

The intentions described above for developing new digital products and services led both firms to diversify their offerings (Ansoff, 1958; Aversa & Hueller, 2023; Menz et al., 2021; Verhoef et al., 2021). These findings not only expand previous literature on digital diversification (Aversa & Hueller, 2023; Ceipek et al., 2021; Ceipek et al., 2019; Menz et al., 2021) but also add that the intentions for using digital technologies are constantly changing. The findings suggest that established firms are more likely to initiate their digital transformation by enhancing current products with basic-level digital technologies, but over time, they implement more advanced-level digital technologies to create new products and services (Porter & Heppelmann, 2015).

#### 6.1.2. Digital business models

The findings suggest that the firms had different intentions with their business models. These ranged from sustaining existing traditional business models of selling product ownership to developing e-commerce and pay-per-use models. For example, the primary digital business model for basic-level digital products was selling ownership (see Alpha and Beta programs in Paper 2). This shows that firms can choose to enhance their products with digital technologies and that firms use existing business models to sell them.

The results demonstrate that over time, firms develop more innovative digital business models. For example, some business units developed new digital business models for alternative ways of capturing value from their new digital products and services (see Business units H and C in Paper 1). These included pay-per-use models (Gamma program in Paper 2) and monthly subscriptions (Delta and Epsilon B programs in Paper 2). The business units also developed new digital sales and e-commerce channels to sell their existing products (see Gamma program in Paper 2 and elaborations on Business unit H and C in Paper 1). These findings confirm existing studies stating that new business models to capture value from digital products and services have been developed within established firms (c.f., Frank et al., 2019; Porter & Heppelmann, 2015). Furthermore, it was noted that firms intended to grow beyond their current markets and establish new markets through their digital products and services, such as Firm South's initiation of the Epsilon A and B programs (Paper 2).

Interestingly, the findings indicate that the development of digital products and services seemed to outpace the introduction of digital business models. As firms actively shifted toward digital products and services, they largely retained their existing business models. The firms' digital business models emerged subsequent to the development of digital products and services. In rare instances (see Gamma and Epsilon B in Paper 2), the business units managed to develop new digital services and digital business models simultaneously. This signals that digital diversification beyond established product ranges and market territory to create a competitive advantage (Porter & Heppelmann, 2014) is possible for established firms (c.f., Nenonen et al., 2019; Verhoef et al., 2021). These insights build on prior work on diversification through new technologies (Aversa & Hueller, 2023; Ceipek et al., 2021; Ceipek et al., 2019), adding a dynamic aspect to the intentions behind digital technology adoption. Initially, the firms embarked on their digital transformation journey by upgrading existing products using basic-level digital technologies. Yet, as these firms digitally matured and evolved, more advanced-

level digital technologies were incorporated into their products and services, and the firms created new digital business models to capture value from them (Frank et al., 2019).

### 6.1.3. Organizational setup

Firm South is composed of three business units (two of which are covered in the studies), each traditionally enjoyed a high degree of autonomy yet was somewhat controlled by the Corporate unit. Singh et al. (2020) argue that this is an indicator of the vertical mechanism of decentralization. This structure allowed each business unit to not only maximize their contributions to Firm South's digital transformation strategy but also serve as leaders of their own transformation. For example, Business unit H had already begun implementing digital technologies when the Corporate unit first introduced the digital transformation strategy for Firm South (see Paper 1).

The findings from Paper 1 highlight that the intended organizational setup change at Firm South's units was to create formal, cross-functional teams to spearhead the development of digital products and services. This setup promoted interdepartmental collaboration and the exchange of information. As the intentions regarding what digital products and services to develop became clearer, formal reorganizations occurred at the business unit and corporate levels. This led to the creation of specialized departments, such as a digital innovation department and the AI lab (Warner & Wäger, 2019), as well as roles such as Chief Technology Officer and Chief Digitalization Officer (Chanias et al., 2019; Singh et al., 2020). Later, the digital innovation department and AI lab were reassigned to specific business units, distancing them from general IT operations and aligning them more directly with the development of digital products and services and digital business models (as seen at Firm South in Paper 1). This suggests that formal horizontal coordination mechanisms (c.f., Singh et al., 2020) were used to improve inter-departmental collaboration in the early phases of the firms' digital transformation.

The digital innovation department and AI lab created separation between the forward-looking digital product and service development and the traditional projects and programs at the business units (see Epsilon A and B in Paper 2). This tactical separation enabled the firm to push digital innovation without being constrained by existing business. Firm South's intentions with the Corporate unit's AI lab were to have them experiment with new digital technologies and business models, develop new business cases, and nurture them until one of the business units were ready to pick up the idea and develop it further (see Gamma and Delta programs in Paper 2). This is in line with Singh et al. (2020) and Verhoef et al. (2021), who argue that decentralization at digitally transforming firms enables increased responsiveness and possibly broadens their economies of scope.

### 6.1.4. The implementation of a digital transformation strategy

In order to realize their respective digital transformation strategy, both firms continuously redefined their strategic intentions, as implied by previous research (Mintzberg, 1978; Mintzberg & Waters, 1985; Sebastian et al., 2020). Firm South's intended digital transformation strategy was to emphasize incorporating digital technologies into existing products, which would enable the creation of new digital services. Paper 1 highlighted how the

top and middle-level managers at Business units H and C interpreted these intentions and developed digital products and services that seemed to align with the intended digital transformation strategy (c.f., Mirabeau & Maguire, 2014; Mirabeau et al., 2018). This became the business units' emergent strategic response to the firm's intended digital transformation strategy. Further, the intended digital transformation strategy and the business units' emergent strategic response enabled the development of new basic- and medium-level digital products for existing markets (Porter & Heppelmann, 2015). However, as customer demand changed and new advanced-level digital technologies appeared, managers at both business units had to reevaluate their emergent strategic responses (Paper 1). This new customer demand mostly affected Business unit H, as the firm perceived their customers to be more positive towards advanced-level digital technologies than Business unit C's customers. Business unit H, subsequently, had to strategically respond to changing customer demand and identify new products and market opportunities in order not to lose ground to its competitors.

The level of responsiveness described above in reference to Business unit H was also critical when developing new business models (Klos et al., 2021; Porter & Heppelmann, 2015). Firm South's ambition to create more value from digital products and services led them to push for new business models, which were incorporated into their intended digital transformation strategy. The emergent strategic response from the business units' managers was to experiment with new subscription models, pay-per-use models, and e-commerce platforms. Business unit H managed to implement several alternative business models for capturing value. The Gamma program described in Paper 2, for instance, utilized a business model of selling access to rather than ownership of products through a pay-per-use model. The Epsilon B program, in contrast, charged customers monthly, bimonthly, or yearly based on the coverage and resolution the customers needed. These examples emphasize Frank et al. (2019) assertion that a more advanced-level digital product or service enables entirely new business models.

Firm South identified that realizing their digital transformation strategy not only requires new products, services, and business models but also organizational setup changes (c.f., Singh et al., 2020; Verhoef et al., 2021; Vial, 2019). The early digital transformation initiatives from the Corporate unit focused on gathering competence connected to digital technologies in a centralized Connectivity hub, and establishing departments at the Corporate unit. This suggests that the intended digital transformation strategy focused on centralizing the digital transformation initiatives to create a common ground for the business units to work from. Later, the Corporate unit decentralized the digital transformation activities to the business units and enabled them to, with relatively high levels of autonomy, contribute to Firm South's digital transformation strategy. This thesis emphasizes that firms not only benefit from decentralizing the digital transformation initiatives and activities (Singh et al., 2020; Verhoef et al., 2021) but also that firms need to centralize certain aspects of the transformation to establish common platforms.

Previous research has emphasized that decentralization and business unit autonomy improve digital transformation (Mustafa et al., 2022). This thesis partly supports this notion but also highlights that the intentions of Firm South led the business units to opt for different—and sometimes non-compatible—emergent strategic responses. For instance, the Delta program's

digital platform was intended to be compatible with both Business unit H and C's products; however, because unit H managed the development process, the platform suited their products better. This thesis, therefore, supports a balance between providing business units and programs with autonomy while taking advantage of product, service, and business model similarities between units and departments and enabling internal collaboration whenever possible.

Another related part of the intended digital transformation strategy was the establishment of digital teams operating cross-functionally to speed up the transformation process. The business units' managers' emergent strategic responses were to establish new departments dedicated to digital innovation within their units. However, these departments created structural and procedural barriers to other inter-unit departments (c.f., Svahn et al., 2017; Vial, 2019). For example, the new digital departments encouraged a trial-and-error approach to experimentation and testing, whereas the traditional departments advocated extensive pre-studies and advised against testing new digital products or services before they had been properly developed. Managers then organized formal cross-functional meetings with key personnel with the intention of reducing poor collaborative compatibility caused by the differences of opinion (Singh et al., 2020).

A related organizational aspect is the fact that established firms are transitioning from traditional to digital firms. As explained earlier, a digital transformation is a time-consuming process that requires long-term engagement (Chanias et al., 2019; Yeow et al., 2018). The studied firms were somewhat lagging behind in this process, which was reflected in the number of digital products and services they were providing. At Firm North, the number of available digital products and services is still small, and the traditional products and services sold using the established business models are still the main source of income. At Firm South, the number of available digital products and services and digital business models is greater than at Firm North; however, most revenues still come from traditional products and business models. Both Firm South and Firm North exemplify how digitally transforming firms are handling both traditional and new digital product and service development demands simultaneously (Porter & Heppelmann, 2015; Smith & Beretta, 2021).

#### 6.1.5. Digital transformation strategy outcomes

The findings from both papers illustrate that Firm South and Firm North partly realized their respective digital transformation strategy. Whether or not a firm realizes its digital transformation strategy is determined based on the type of performance metrics employed. It was observed that managers initially relied on more conventional performance measurements, such as ROI and revenue generation. Notably, when managers used these traditional measurements on digital products and services, they often perceived the digital transformation strategy to be unrealized, as such products and services rarely generated significant revenues (see Paper 1). However, as the digital transformation progressed, managers identified alternative metrics, such as calculating the number of connected products or promoting a positive brand image, to support the digital transformation strategy realization (Libert et al., 2016; Porter & Heppelmann, 2014). This highlights that the metrics for measuring the performance of digital products and services have changed over time (Verhoef et al., 2021). For instance, the Epsilon A program provided limited opportunities for value capture, but

Business unit H acknowledged its potential to enhance user value and bolster brand image, which was later recognized by Firm South (Paper 2). Additionally, it became apparent that managers also considered knowledge to be a valuable outcome during the digital transformation. The exposition of the Beta, Gamma, and Delta programs from Paper 2 suggests that facilitating new knowledge creation and the development of new programs contributes to the realization of digital transformation strategies (Kane et al., 2015).

## 6.2. Why some digital transformation strategies are realized while others are not

The second research question of this thesis expands the scholarly understanding of why some digital transformation strategies in established firms are realized while others are not. The thesis emphasizes three elements related to the three digital transformation dimensions (digital products and services, digital business models, and organizational setup changes) that hindered the realization of the digital transformation strategies. More specifically, the interplay between these three dimensions affected the realization process. The first element is the integration of the digital product and service dimension with the digital business model dimension, which suggests the firm needs to align the digital products and services with the market. Second, integrating digital products and services and organizational setup changes affect the firm's ability to collaborate externally and internally. Third, a lack of interplay between all three dimensions decreases the alignment between the current business strategy and the digital transformation strategy. Although managing these three elements will not guarantee that the digital transformation strategy will be realized, they provide some concrete examples of typical shortcomings identified at the firms.

### 6.2.1. Aligning digital products and services with the market

The first element affecting the realization of digital transformation strategies was the ability to combine the digital products and services with the digital business model dimension. Paper 2 highlighted that the basic-level digital products fared better when marketed toward known customers. This is because the firm has a better understanding of these customers' needs and can address them appropriately. Firm North, with its Beta program (Paper 2), exemplified this point by managing to address a specific customer need with its new, digitally enhanced product. However, in comparison, targeting a digital product using basic-level digital technologies for a new customer segment created challenges. In the case of Firm North's Alpha program (Paper 2), the targeted customers' needs were unclear, meaning that the development team struggled to identify what features customers wanted. As a result, the product included more digital and non-digital features than needed, making it too complex and expensive for the intended customers. This setback subsequently slowed down the digital transformation at Firm North, as it created doubts regarding the necessity of adding digital technologies to products.

However, in the programs using advanced-level digital technologies, the correlation was inverted. In this case, targeting a known customer did not turn out to be beneficial. As the use of advanced-level digital technologies required more experimentation than the use of basic-level digital technologies, targeting a specific customer early on limited the program's ability to respond to environmental changes. If the program did not fit the targeted customer, the

program team struggled to change the program's focus. The Epsilon B program (Paper 2), run by Firm South's AI lab within the Corporate unit and later transferred to Business unit H, initially showed potential; however, as it did not address the customers' needs in the intended ways, it was put on hold approximately three years after its initiation. However, if the targeted customer was not defined in the early stages, the programs had a better chance of continuing. The developers of the Epsilon A program (Paper 2) were instead able to spend time experimenting with the potential uses of the program, adjusting it to the needs of a later-defined customer segment. The program subsequently received significant recognition from Firm South and features as a positive example of what Firm South can accomplish with their digital transformation.

This element of aligning digital products and services with the market further emphasizes the need to constantly adapt the digital transformation strategy to new conditions (Chanas & Hess, 2016). It highlights that firms benefit from combining intended and emergent strategic responses (Mintzberg, 1978; Mintzberg & Waters, 1985; Mirabeau & Maguire, 2014; Mirabeau et al., 2018). Further, the findings stress that even though Epsilon B was developed within the detached and innovative AI lab, its managers struggled to be flexible when they did not fulfill customers' demands.

#### 6.2.2. Internal and external collaboration

The second element relates to the combination of the digital products and services with organizational setup changes, which affected the units' ability to collaborate both internally and externally with customers. This thesis confirms previous research regarding the importance of internal and external collaboration as an enabler for digital transformation strategy realization (Nylén & Holmström, 2015; Svahn et al., 2017). The findings verify that the business units' departments involved in digital product and service development must collaborate closely with each other. As pointed out in Paper 1, a lack of collaboration between traditional engineering departments and programming and data science departments made it difficult for them to understand each other's needs. The mechanical engineers wanted to build the digital product in the same way as a non-digital product, while the programmers and data scientists emphasized the importance of having embedded digital technologies as core components of the products, which would provide richer product data. This lack of defined procedures for developing a new digital product increased the difficulty of internal collaboration. Furthermore, external customer collaborations during product and service development differed widely between the studied programs. In all but the case of Epsilon B, increased levels of customer collaboration were beneficial and contributed positively to the programs. In some instances, customer collaborations involved developing and building prototypes for key customers to test (Beta program in Paper 2), providing small-scale offerings to specific customers and geographical areas (Gamma program in Paper 2), and actively working to improve the digital service based on customer feedback (Epsilon A program in Paper 2). These types of customer collaborations differed from the firms' and business units' typical approach, which was previously internally focused, and involved trusting employees to know what customers wanted. However, for Epsilon B, the technical difficulties meant that increased customer collaboration had no clear positive effect.

The improved internal and external collaboration exhibited in programs such as Gamma and Epsilon A at Firm South's Business unit H and Beta at Firm North had a positive impact on the firms' respective digital transformation strategy. As the programs gained recognition from top management, especially in the case of Epsilon A, they became a benchmark for how to perform digital programs. The Epsilon A program included external partners from the start and managed to sustain the collaboration throughout the program's development. This enabled the developers to apply digital technologies to Epsilon A, which could be useful in future products. This was one of the reasons why Business unit H wanted to include Epsilon A in its unit. The thesis, therefore, supports the findings of previous studies regarding the importance of internal and external collaboration for realizing the digital transformation strategy (Chanias & Hess, 2016; Chanias et al., 2019; Sebastian et al., 2020; Warner & Wäger, 2019).

### 6.2.3. Aligning the current business strategy with the digital transformation strategy

The third and last element suggests that an inability to combine all three dimensions of a digital transformation led to uncertainties regarding the significance of having a digital transformation strategy. Previous research has emphasized the importance of aligning the current business strategy with the digital transformation strategy (Chanias et al., 2019; Matt et al., 2015). This thesis highlighted that while both firms are working to digitally transform themselves, their current modes of doing business do not support the realization of their respective digital transformation strategy. Their current business practices, namely focusing on selling high-quality and innovative products through a well-established retailer network, have enabled both firms to achieve operating margins above their respective industry averages. Both papers emphasize that the responses of employees when faced with the demands of the digital transformation were mixed. Some employees embraced the potential of digital technologies and advocated for more investments in developing digital products and services. They expressed that if their firm does not invest sufficiently in digital technologies now, their competitors will soon outcompete them. The Alpha program at Firm North, for instance, was meant to be a future-proof product that would confirm Firm North's intentions of developing digital products. In contrast, some employees felt a lack of urgency and sensed that customers were not yet ready for digital products and services. These employees instead wanted to maintain the status quo and perceived digital technologies to be additional costs to the products that would lower profit margins (Paper 1). These two mixed responses demonstrated tendencies to slow down the digital transformation at both firms. The role of the digital transformation strategy is, therefore, to reduce confusion regarding the firm's intentions (Matt et al., 2015), express clear directions, and actively work to engage employees (Chanias et al., 2019; Vial, 2019). In this context, this thesis emphasizes the importance of combining the three dimensions of a digital transformation to enable for realizing the firm's digital transformation strategy.

The issues of aligning the current business strategy with the digital transformation strategy was further reflected in the level of engagement and support shown by managers for different digital products and services. The findings highlighted that top management tended to support basic-level digital products and services over advanced-level products and services. Employees explained that the reason for top management supporting basic-level digital products and

services was that they perceived these to come with less risk and greater possibilities for monetization. Top management also tended to advocate the continuation of programs that correlated with their own interests despite showing limited potential for growth. The findings from Paper 2, for instance, highlighted that the Alpha program probably would have been suspended earlier due to poor product functionality and high costs if the owner of Firm North had not strongly advocated for its continuation. Further, Paper 1 highlighted that managers at Business unit H and the Corporate unit expressed that advanced-level digital products and services, such as Epsilon A and B, did not receive initial support from top management at Firm South, who advocated canceling them due to limited connections with the current business. The AI lab, however, perceived the programs as interesting and continued their development. Although Epsilon B struggled to reach its intended outcomes, Epsilon A is now receiving support from Firm South's top management. This suggests that the emerging strategic responses (Mintzberg, 1978; Mintzberg & Waters, 1985; Mirabeau & Maguire, 2014; Mirabeau et al., 2018) from lower and middle-level managers help firms realize their digital transformation strategy. It highlights that lower and middle-level managers use their abilities to solve tensions and respond to changing demands (Chanas & Hess, 2016; Chanas et al., 2019). They are also able to reallocate human and monetary resources to where they are most needed to propel the digital transformation strategy realization process forward.

Further, as mentioned in Chapter 6.1.5, a digital transformation strategy cannot be entirely realized unless the firms introduce new ways of measuring outcomes. Both papers highlighted that the traditional measurements advocated by the current business strategy supported the development basic-level digital products and services. In contrast, the development of advanced-level digital products and services was negatively affected by the traditional measurements, and these products and services instead needed new measurements which emphasized other aspects. As the advanced-level digital products and services rarely created significant financial returns, managers instead had to design alternative measurements which would support their continuation. Such measurements instead advocate for performance outcomes such as customer engagement and firm image (Libert et al., 2016; Lüthge, 2020), which traditional performance measurements do not take into consideration. The findings from Paper 2 emphasize this point through the examples of the Epsilon A and B programs. While the Epsilon B program, which incorporates advanced-level machine learning abilities, showed significant potential based on the traditional performance measurement of potential ROI, it did not manage to create sufficient value for customers. One of the issues was that the program team spent more time on value capture than on value creation, the opposite approach to the sustained Epsilon A program.



## 7. Discussion

This chapter will briefly discuss two aspects related to this thesis: first, explaining the dynamism of digital transformation strategies and second, the difference between a realized and a successful digital transformation strategy.

### 7.1. The dynamism of digital transformation strategies

This thesis emphasized that the process of realizing a digital transformation strategy requires a combination of intended strategies and emergent strategic responses, making the process highly dynamic (Björkdahl, 2020; Chanias et al., 2019; Vial, 2019; Yeow et al., 2018). However, while most existing research explain the dynamism of digital transformation strategies in terms of recursive and cyclical activities (Chanias & Hess, 2016; Yeow et al., 2018), this thesis builds on Chanias et al.'s (2019) notion that a digital transformation strategy process consists of parallel and recursive activities (c.f., Cloutier & Langley, 2020). However, while emphasizing these activities, this thesis also acknowledges the existence of linear activities within the execution of a digital transformation strategy (c.f., Cloutier & Langley, 2020). For instance, the findings from the firms and business units revealed that they first incorporated basic-level digital technologies into existing products, then integrated advanced-level digital technologies into existing products, and finally created entirely new products and services based on advanced-level digital technologies. Furthermore, Firm South and its business units changed their business models from transactional models that involve selling product ownership towards pay-per-use models that involve selling access to products and lastly models that involve selling products as a service. The firms also indicated that they had shifted from a traditional organizational setup of departmental separation to a setup based on cross-functional teams and new digital departments.

The parallel activities identified in this thesis relate to developing new digital products and services while simultaneously creating new business models and changing the organizational setup. The findings emphasized the need for aligning business models with digital products or services. For example, traditional business models are suitable for basic-level digital products, but advanced-level digital products and services required new business models. Further, organizational setups were also changed in parallel to the digital product and service and digital business model development. This included setting up departments that are dedicated to digital innovation and possess competencies in connectivity, data processing, and AI, as well as cross-functional teams that enhance collaboration between departments.

The recursive activities highlight the adaptations and reevaluations that the firms and business units undertook as part of executing the firms' digital transformation strategies. The emergence of new and more advanced-level digital technologies created opportunities to develop new products and services to reach new markets and customers. This process required managers to make iterative changes to their product designs and business models to conform to the needs of the targeted customers. For example, the intention with the Delta program was to sell it via a subscription model, but as customers were not interested in such an arrangement, the program had to reevaluate how to offer Delta to its customers (Papers 1 & 2).

## 7.2. The difference between a realized and successful digital transformation strategy

The thesis partly sought to study why some firms' digital transformation strategies are realized while those of others are not. A common perception of employees at the studied firms was that the launch of successful digital products and services and/or digital business models contributed to the digital transformation strategy realization. This part of the discussion will focus on distinguishing a successful digital transformation strategy from a realized one.

Previously, this thesis stated that a realized digital transformation strategy is dependent on how a firm performs the digital transformation, from its initiation to implementation and, finally, performance measurement. Further, this thesis argued that a realized digital transformation strategy enables a firm to change how they deploy digital technologies; it also enables them to develop new digital products and services and digital business models and make organizational setup changes with the aim of reaching new markets and customers to generate and appropriate additional value. A realized strategy is, therefore, likely to be sustained as the firm perceives it as providing certain benefits. This would suggest that a successful digital transformation strategy is one that has been realized; however, in comparison, a realized digital transformation strategy is not necessarily successful. The definition of a digital transformation highlights that firms develop new digital products, services, and business models and make organizational changes with the *aim* of generating additional value. However, a firm can make these changes but fail to benefit from them. This can be explained with reference to the earlier example of Swedish telecommunications firm Ericsson's newly established Digital Service division (Björkdahl, 2020). Despite managing to build an entirely new division with a new product and service portfolio, the division was unable to generate revenue and was forced to downsize. In the case of the Digital Service division, they contributed to realizing Ericsson's digital transformation strategy, but the division's products and services were unsuccessful, and resulted in significant losses.

The Gamma program at Business unit H provides another interesting example. The program began on a small scale with the intention of scaling it up as time progressed. However, when it failed to generate the expected returns, it received less funding and stagnated as a result. In this example, the program managed to develop a functioning service and offer it to paying customers. In this respect, the program contributed to the realization of the firm's digital transformation strategy. However, the lack of financial returns meant managers did not consider it to have contributed to a successful digital transformation strategy. Another example is the Epsilon A program which also launched a new service that received positive responses from users. However, although it did not generate a profit, managers still regarded it as a success for Firm South. Epsilon A can, therefore, be seen as contributing to a realized and successful digital transformation strategy. This again highlights the possibility for established firms to emphasize other types of value apart from financial returns.

## 8. Conclusions and future research

This thesis began with a quote from a software architect engineer at Firm South who expressed that he felt the digital transformation strategy execution process at his firm had been chaotic and unstructured. There were many meetings in the beginning, and departments started experimenting with new digital technologies; however, the lack of clear directions hampered the firms' initial progress. After extensive experimentation and development, the intentions with the digital transformation strategy became clearer. This chapter will summarize the main findings of this thesis, describe its theoretical and managerial implications, and provide suggestions for future research.

### 8.1. RQ1: How are digital transformation strategies executed within established firms?

This thesis highlights that the studied firms tried to realize their respective digital transformation strategy in different ways. The analysis highlighted the intentions firms have with their digital transformation strategy using the three dimensions of the digital transformation: digital products and services, digital business models, and organizational setup changes. The findings revealed that the early digital transformation strategy intentions at the firms, corporate unit and the business units focused on adding basic-level digital technologies to existing products. As they gained a better understanding of how digital technologies can enhance product performance, they adjusted the digital transformation strategy. Subsequently, Firm South and its business units moved toward integrating advanced-level digital technologies in its products and services. The business model and organizational setup dimensions followed a similar logic of development, starting with minor changes and gradually evolved. This demonstrates that both firms' digital transformation strategies were not only linear but required constant reevaluation and reworking. This thesis then emphasized the dynamism of the process of executing a digital transformation strategy (Chanias & Hess, 2016; Chanias et al., 2019; Cloutier & Langley, 2020; Matt et al., 2015). It also stressed that managers had to develop new emergent strategic responses to address the shortcomings of the firm's intended digital transformation strategy (Mirabeau & Maguire, 2014).

### 8.2. RQ2: Why are some digital transformation strategies realized, while others are not, in established firms?

This thesis identified three main elements that affected a firm's ability to realize its digital transformation strategy. First, firms and their business units must align their digital products and services with the market and potential customers. Basic-level digital products and services benefit from a clear target customer segment, while advanced-level digital products and services benefit from more flexibility. Second, the alignment of the digital products and services with the organizational setup dimensions supported internal and external collaboration. This is important because cross-functional collaboration between departments enables the integration of digital technologies into products and because external collaboration with customers provide opportunities for developing useful digital products. Third, an inability to combine all digital transformation dimensions led to a misalignment between the digital transformation strategy and current business strategy. The reason being that as the current way

of doing business generated significantly higher financial returns, and not managing the three dimensions resulted in the digital transformation being less of a priority.

### 8.3. Theoretical implications

This thesis builds on previous studies on digital transformations and digital transformation strategies. This thesis partially responds to Chaniyas et al. (2019) calls to (1) explain the process of the digital transformation strategy, (2) explore the successes and failures of digital transformation strategies, and (3) clarify the factors impacting whether or not a digital transformation strategy is realized. First, Paper 1 provided insights into how Firm South has executed its digital transformation strategy. Paper 2, meanwhile, provided specific details regarding six digital diversification programs at Firm South and Firm North. Together, the two papers contribute to our understanding of how digital transformation strategies are executed within established firms. Second, Paper 2 specifically studied digital diversification programs that have achieved varying levels of realization, and that have differently impacted the realization of the firms' respective digital transformation strategy. While the thesis does not recommend specific measures for identifying whether a digital transformation strategy has been successful, it does provide examples of both realized and unrealized digital programs and provides a short discussion on the difference between a successful and a realized digital transformation strategy. Third, the thesis provided insights into the factors impacting whether a digital transformation strategy is realized, and it emphasizes that the use of alternative measurements of traditional ROI, such as learning of employees and brand image, can be valuable for established firms.

### 8.4. Managerial implications

This thesis underscores that although the intention to execute a digital transformation strategy is an important starting point, managers must continuously formulate emergent strategic responses to realize a firm's digital transformation strategy. Managers should also work swiftly to identify new opportunities and potential competition. In this context, this thesis encourages managers to proactively search for and experiment with digital technologies, business models, and organizational setup changes.

Managers further need to consider potential coordination issues between digital products and services, digital business models, and organizational setup changes. This thesis emphasized three elements which increased the difficulty of realizing the digital transformation strategy. First, the alignment between digital products and services and the market does not mean managers should only invest in clear business cases but also acknowledge that it can take time to find appropriate uses for, especially, advanced-level digital products and services. Second, internal and external collaboration is critical to ensuring the functionality of a digital product or service; however, enabling collaboration also requires managers to make organizational setup changes. Firm South's AI lab is a good example of such a change. Third, a digital transformation can also create tension between the firm's existing business strategy and the digital transformation strategy. The former tend to emphasize incremental development and short-term financial returns, whereas the latter seeks to ensure long-term relevance. Managers, therefore, need to balance the imperative to generate financial returns with the need to facilitate

experimentation with digital technologies, as a digital transformation is evolutionary rather than revolutionary.

Further, this thesis highlights that to reap the benefits of the digital transformation, firms must be willing to reconsider traditional performance measurements. Top management is under considerable pressure from shareholders and owners to produce profits, meaning they need to balance long-term investments with short-term revenue. Therefore, managers often use traditional measurements, such as ROI, to evaluate digital programs. However, because digital programs rarely provide significant returns due to long development times and unclear benefits for customers, top management often wants to suspend them. Utilizing other measurements, such as branding and customer satisfaction, could provide a more accurate assessment of a program's potential.

### **8.5. Future research**

There are multiple potential avenues for further research in this field. This thesis emphasizes two in particular. The first relates to Chanias et al.'s (2019) call for studies that clarify the precise meaning of a successful and failed digital transformation. While this thesis provides some insights on this matter, further research is needed to identify more indicators for measuring success. A suitable approach would be to complement the many qualitative studies on digital transformations with quantitative studies. Second, future research could also look more into the digital transformation strategy realization process of established service firms. This would be interesting because there are key differences between these firms in terms of what they offer to their customers, how they create and capture value, and the types of competencies they possess. The preliminary interviews with industry experts and project managers conducted by me and my project team, as well as observations at an exhibition, revealed that exhibition industry are still lagging in engaging in a digital transformation in comparison to the manufacturing industry. This is true despite the COVID-19 pandemic which prevented exhibitions from taking place at venues where people could physically meet, and the fact that some exhibitions experimented with digital alternatives. Our preliminary interviews and observations showed that most exhibition firms and participants wanted to return to the traditional venues and meetings in person. In contrast to manufacturing firms, who are technology optimists, exhibition firms expressed a general skepticism toward digital technologies. While these are only preliminary findings, they point to a potentially interesting difference between manufacturing and service firms.



## Reference list

- Agarwal, G. K. (2022). *Revising Business Model Innovation: Towards a Value Process Framework for AI-based Offerings* [KTH Royal Institute of Technology]. Stockholm.
- Ansoff, H. I. (1958). A model for diversification. *Management Science*, 4(4), 392-414.
- Aversa, P., & Hueller, F. (2023). Digital diversification. In C. Cennamo, G. Battista Dagnino, & F. Zhu (Eds.), *Research Handbook on Digital Strategy* (pp. 18-43). Cheltenham, UK: Edward Elgar Publishing Limited.
- Bell, E., Bryman, A., & Harley, B. (2019). *Business Research Methods* (5 ed.). Oxford, UK: Oxford University Press.
- Bergek, A., Tell, F., Berggren, C., & Watson, J. (2008). Technological capabilities and late shakeouts: industrial dynamics in the advanced gas turbine industry, 1987–2002. *Industrial and Corporate Change*, 17(2), 335-392.
- Bharadwaj, A., El Sawy, O. A., Pavlou, P. A., & Venkatraman, N. v. (2013). Digital business strategy: toward a next generation of insights. *MIS Quarterly*, 37(2), 471-482.
- Björkdahl, J. (2020). Strategies for digitalization in manufacturing firms. *California Management Review*, 62(4), 17-36.
- Björkdahl, J., Wallin, M. W., & Kronblad, C. (2018). *Digitalisering - mer än teknik. Kartläggning av svensk forskning och näringslivets behov*. VR 2018:06, 1650-3104, Vinnova.
- Burgelman, R. A., Floyd, S. W., Laamanen, T., Mantere, S., Vaara, E., & Whittington, R. (2018). Strategy processes and practices: Dialogues and intersections. *Strategic Management Journal*, 39(3), 531-558.
- Ceipek, R., Hautz, J., De Massis, A., Matzler, K., & Ardito, L. (2021). Digital transformation through exploratory and exploitative internet of things innovations: the impact of family management and technological diversification. *Journal of Product Innovation Management*, 38(1), 142-165.
- Ceipek, R., Hautz, J., Mayer, M. C., & Matzler, K. (2019). Technological diversification: A systematic review of antecedents, outcomes and moderating effects. *International Journal of Management Reviews*, 21(4), 466-497.
- Chanias, S., & Hess, T. (2016). Understanding digital transformation strategy formation: Insights from Europe's automotive industry. Pacific Asia Conference on Information Systems (PACIS), Chiayi, Taiwan.
- Chanias, S., Myers, M. D., & Hess, T. (2019). Digital transformation strategy making in pre-digital organizations: The case of a financial services provider. *The Journal of Strategic Information Systems*, 28(1), 17-33.
- Cloutier, C., & Langley, A. (2020). What makes a process theoretical contribution? *Organization Theory, Volume 1*, 1-32.
- Correani, A., De Massis, A., Frattini, F., Petruzzelli, A. M., & Natalicchio, A. (2020). Implementing a digital strategy: Learning from the experience of three digital transformation projects. *California Management Review*, 62(4), 37-56.
- Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Review*, 14(4), 532-550.
- Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges. *Academy of Management Journal*, 50(1), 25-32.
- Fitzgerald, M., Kruschwitz, N., Bonnet, D., & Welch, M. (2014). Embracing digital technology: A new strategic imperative. *MIT Sloan Management Review*, 55(2), 1-12.
- Frank, A. G., Mendes, G. H., Ayala, N. F., & Ghezzi, A. (2019). Servitization and Industry 4.0 convergence in the digital transformation of product firms: A business model innovation perspective. *Technological Forecasting and Social Change, Volume 141*, 341-351.

- Furr, N., Ozcan, P., & Eisenhardt, K. M. (2022). What is digital transformation? Core tensions facing established companies on the global stage. *Global Strategy Journal*, 12(4), 595-618.
- Hadlington, L., & Scase, M. O. (2018). End-user frustrations and failures in digital technology: exploring the role of Fear of Missing Out, Internet addiction and personality. *Heliyon*, Volume 4, 1-18.
- Hanelt, A., Bohnsack, R., Marz, D., & Antunes Marante, C. (2021). A systematic review of the literature on digital transformation: Insights and implications for strategy and organizational change. *Journal of Management Studies*, 58(5), 1159-1197.
- Hess, T., Matt, C., Benlian, A., & Wiesböck, F. (2016). Options for formulating a digital transformation strategy. *MIS Quarterly Executive*, 15(2), 123-139.
- Holland, C. P., & Kavuri, A. (2021). Artificial intelligence and digital transformation of insurance markets. *The CAPCO Institute Journal of Financial Transformation*, 54(November), 104-115.
- Ibem, E. O., & Laryea, S. (2014). Survey of digital technologies in procurement of construction projects. *Automation in Construction*, Volume 46, 11-21.
- Imran, F., Shahzad, K., Butt, A., & Kantola, J. (2021). Digital transformation of industrial organizations: Toward an integrated framework. *Journal of Change Management*, 21(4), 451-479.
- Jarzabkowski, P. (2004). Strategy as practice: recursiveness, adaptation, and practices-in-use. *Organization Studies*, 25(4), 529-560.
- Kane, G. C., Palmer, D., Phillips, A. N., Kiron, D., & Buckley, N. (2015). *Strategy, not technology, drives digital transformation*. MIT Sloan Management Review. Retrieved 13 April 2023 from <https://sloanreview.mit.edu/projects/strategy-drives-digital-transformation/>
- Kaplan, R. S., & Norton, D. P. (1992). The balanced scorecard - measures that drive performance. *Harvard Business Review*, 70(1), 71-79.
- Klos, C., Spieth, P., Clauss, T., & Klusmann, C. (2021). Digital Transformation of Incumbent Firms: A Business Model Innovation Perspective. *IEEE Transactions on Engineering Management*, 70(6), 2017-2033.
- Langley, A., Smallman, C., Tsoukas, H., & Van de Ven, A. H. (2013). Process studies of change in organization and management: Unveiling temporality, activity, and flow. *Academy of Management Journal*, 56(1), 1-13.
- Libert, B., Beck, M., & Wind, Y. (2016). Questions to ask before your next digital transformation. *Harvard Business Review*, 60(12), 11-13.
- Lüthge, A. (2020). The concept of relatedness in diversification research: review and synthesis. *Review of Managerial Science*, 14(1), 1-35.
- MacKay, B., Arevuo, M., Mackay, D., & Meadows, M. (2020). *Strategy: Theory, Practice, Implementation*. Oxford, UK: Oxford University Press.
- Matt, C., Hess, T., & Benlian, A. (2015). Digital transformation strategies. *Business & Information Systems Engineering*, 57(5), 339-343.
- McKinsey. (2018). *Unlocking Success In Digital Transformations: Survey*. Retrieved 27 May 2022 from <https://www.mckinsey.com/business-functions/people-and-organizational-performance/our-insights/unlocking-success-in-digital-transformations>
- Menz, M., Kunisch, S., Birkinshaw, J., Collis, D. J., Foss, N. J., Hoskisson, R. E., & Prescott, J. E. (2021). Corporate Strategy and the Theory of the Firm in the Digital Age. *Journal of Management Studies*, 58(7), 1695-1720.
- Merriam, S. B., & Tisdell, E. J. (2016). *Qualitative Research - A Guide to Design and Implementation* (4 ed.). San Francisco, CA: Jossey-Bass A Wiley Brand.
- Mintzberg, H. (1978). Patterns in strategy formation. *Management Science*, 24(9), 934-948.

- Mintzberg, H. (1987). The strategy concept I: Five Ps for strategy. *California Management Review*, 30(1), 11-24.
- Mintzberg, H., & Waters, J. A. (1985). Of strategies, deliberate and emergent. *Strategic Management Journal*, 6(3), 257-272.
- Mirabeau, L., & Maguire, S. (2014). From autonomous strategic behavior to emergent strategy. *Strategic Management Journal*, 35(8), 1202-1229.
- Mirabeau, L., Maguire, S., & Hardy, C. (2018). Bridging practice and process research to study transient manifestations of strategy. *Strategic Management Journal*, 39(3), 582-605.
- Monaghan, S., Tippmann, E., & Coviello, N. (2020). Born digitals: Thoughts on their internationalization and a research agenda. *Journal of International Business Studies*, 51(1), 11-22.
- Mustafa, G., Solli-Sæther, H., Bodolica, V., Håvold, J. I., & Ilyas, A. (2022). Digitalization trends and organizational structure: bureaucracy, ambidexterity or post-bureaucracy? *Eurasian Business Review*, 12(4), 671-694.
- Nag, R., Hambrick, D. C., & Chen, M. J. (2007). What is strategic management, really? Inductive derivation of a consensus definition of the field. *Strategic Management Journal*, 28(9), 935-955.
- Nambisan, S., Wright, M., & Feldman, M. (2019). The digital transformation of innovation and entrepreneurship: Progress, challenges and key themes. *Research Policy*, 48(8), 103773.
- Naslund, J. A., Shidhaye, R., & Patel, V. (2019). Digital technology for building capacity of non-specialist health workers for task-sharing and scaling up mental health care globally. *Harvard Review of Psychiatry*, 27(3), 1-21.
- Nenonen, S., Storbacka, K., & Windahl, C. (2019). Capabilities for market-shaping: Triggering and facilitating increased value creation. *Journal of the Academy of Marketing Science*, 47(4), 617-639.
- Nylén, D., & Holmström, J. (2015). Digital innovation strategy: A framework for diagnosing and improving digital product and service innovation. *Business Horizons*, 58(1), 57-67.
- Paroutis, S., & Pettigrew, A. (2007). Strategizing in the multi-business firm: Strategy teams at multiple levels and over time. *Human Relations*, 60(1), 99-135.
- Paschou, T., Rapaccini, M., Adrodegari, F., & Saccani, N. (2020). Digital servitization in manufacturing: A systematic literature review and research agenda. *Industrial Marketing Management*, Volume 89, 278-292.
- Pietronudo, M. C., Zhou, F., Caporuscio, A., La Ragione, G., & Risitano, M. (2022). New emerging capabilities for managing data-driven innovation in healthcare: the role of digital platforms. *European Journal of Innovation Management*, 25(6), 867-891.
- Porter, M. E. (1996). What is strategy? *Harvard Business Review*, 74(6), 61-78.
- Porter, M. E., & Heppelmann, J. E. (2014). How smart, connected products are transforming competition. *Harvard Business Review*, 92(11), 64-88.
- Porter, M. E., & Heppelmann, J. E. (2015). How smart, connected products are transforming companies. *Harvard Business Review*, 93(10), 96-114.
- Schräge, M., Muttreja, V., & Kwan, A. (2022). How the Wrong KPIs Doom Digital Transformation. *MIT Sloan Management Review*, 63(3), 35-40.
- Sebastian, I. M., Ross, J. W., Beath, C., Mockler, M., Moloney, K. G., & Fonstad, N. O. (2020). How big old companies navigate digital transformation. In *Strategic information management* (pp. 133-150). Routledge.

- Siachou, E., Vrontis, D., & Trichina, E. (2021). Can traditional organizations be digitally transformed by themselves? The moderating role of absorptive capacity and strategic interdependence. *Journal of Business Research*, *Volume 124*, 408-421.
- Siggelkow, N. (2007). Persuasion with case studies. *Academy of Management Journal*, *50*(1), 20-24.
- Simonsson, J. A. (2021). *Towards Digital Product-Service Platforms in Manufacturing Firms: Exploring Organizational and Managerial Aspects* [KTH Royal Institute of Technology]. Stockholm.
- Singh, A., Klärner, P., & Hess, T. (2020). How do chief digital officers pursue digital transformation activities? The role of organization design parameters. *Long Range Planning*, *53*(3), 101890.
- Smith, P., & Beretta, M. (2021). The gordian knot of practicing digital transformation: Coping with emergent paradoxes in ambidextrous organizing structures. *Journal of Product Innovation Management*, *38*(1), 166-191.
- Svahn, F., Mathiassen, L., & Lindgren, R. (2017). Embracing Digital Innovation in Incumbent Firms. *MIS Quarterly*, *41*(1), 239-254.
- Tabrizi, B., Lam, E., Girard, K., & Irvin, V. (2019). Digital transformation is not about technology. *Harvard Business Review*, *97*(2), 1-6.
- Teece, D. J. (2010). Business models, business strategy and innovation. *Long Range Planning*, *43*(2-3), 172-194.
- Van de Ven, A. H. (1992). Suggestions for studying strategy process: A research note. *Strategic Management Journal*, *13*(S1), 169-188.
- Verhoef, P. C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Dong, J. Q., Fabian, N., & Haenlein, M. (2021). Digital transformation: A multidisciplinary reflection and research agenda. *Journal of Business Research*, *Volume 122*, 889-901.
- Vial, G. (2019). Understanding digital transformation: A review and a research agenda. *The Journal of Strategic Information Systems*, *28*(2), 118-144.
- Warner, K. S., & Wäger, M. (2019). Building dynamic capabilities for digital transformation: An ongoing process of strategic renewal. *Long Range Planning*, *52*(3), 326-349.
- Westerman, G., Bonnet, D., & McAfee, A. (2014). The nine elements of digital transformation. *MIT Sloan Management Review*, *55*(3), 1-6.
- WIPO. (2022). *Global Innovation Index 2022: What is the future of innovation-driven growth?* Geneva, Switzerland.
- Wong, J. K. W., Ge, J., & He, S. X. (2018). Digitisation in facilities management: A literature review and future research directions. *Automation in Construction*, *Volume 92*, 312-326.
- Yeow, A., Soh, C., & Hansen, R. (2018). Aligning with new digital strategy: A dynamic capabilities approach. *The Journal of Strategic Information Systems*, *27*(1), 43-58.
- Yin, R. K. (2018). *Case Study Research and Applications: Design and Methods* (6 ed.). Thousand Oaks, CA: SAGE Publishing.
- Yoo, Y., Henfridsson, O., & Lyytinen, K. (2010). Research commentary—the new organizing logic of digital innovation: an agenda for information systems research. *Information Systems Research*, *21*(4), 724-735.

## Appendix A: Interview list Appended Paper 1

All interviews conducted at Firm South. Interviews were conducted in English unless else is noted.

	Round 1, August 2019 – August 2020	Round 2, 2021 April-June (online)	Round 3, 2021 October- November (online)	Round 4, 2023 March-April (online)
<b>Group level</b>				
VP Applied Digital Innovation	Duration 64:30.	10 May, Duration 63:24.		
VP Accelerated Innovation & Venturing	Duration 61:39.			
Software architect engineer			17 October 2022, Duration 65:17.	30 March, Duration 57:59.
<b>Business unit H</b>				
VP Sales and Services	Duration 45:40.	5 May, Duration 43:02. Swedish		
Director Digital Solutions & Services	Duration 53:34.	28 April, Duration 52:30.		
Director of Product Management			22 November, Duration 56:22. Swedish	
Business Development and Servitization Manager			21 October, Duration 46:47. Swedish	
Product Manager Handheld			27 October, Duration 43:11. Swedish	
Director Business Development Robotic Digitalization & Innovation			8 November, Duration 61:05. Swedish	

<b>Business unit C</b>				
VP Department CS&D	Duration 53:43.			
Director Product & Service Management	Duration 50:28.		22 October, Duration 52:32.	24 April, Duration 60:54.
Services Business Development Manager	Duration 81:10.	28 April, Duration 60:35.		
VP Department CS&F	Duration 59:47.	30 April, Duration 57:11.		
VP Aftermarket & Connectivity	Duration 49:57.	20 May, Duration 65:42.		
Product Director Digital Service	Duration 59:03.		22 October, Duration 63:23.	
Primary Development Manager	Duration 87:13.	29 April, Duration 60:09.		
<b>AI lab</b>				
Director of Intelligence		1 June, Duration 38:23.		
Director AI lab		1 June, Duration 62:12.		6 April, Duration 67:00.

## Appendix B: Interview guide Appended Paper 1

### *Firm's digitalization activities.*

1. Do you have any overall digitalization strategy?
  - a. How your digitalization strategy has been changing the last 1,5 years?
2. How do you implement digitalization such as product, service and manufacturing etc. in your department?

### *Implementations, Impacts and Challenges of Digitalization*

3. How does your digitalization affect your business processes such as your way of capturing customer needs, management practices and organization?
  - a. How your organization and business processes related to digitalization have changed last 1,5 years?
4. What kinds of challenges do you face during this development and implementations? How did/do you try solving them?
  - a. How have these challenges/obstacles changed during the last 1,5 years?
5. Have you experienced some organizational obstacles such as competence during the implementation? How did/do you try solving them?
  - a. How have these challenges/obstacles changed during the last 1,5 years?
6. Do you have any role models/firms which inspire you?
  - a. Has the involvement of top management in the formation of a digital strategy changed the last year?

### *Ecosystem*

7. Which external actors do you involve in the developments of new digital solutions? Have you added any new actors in your ecosystem?
8. Has your own role changed in your ecosystem?
9. What kinds of challenges did you face during this new ecosystem development/reconfiguration?
  - a. How have your ecosystem and your relationship with the ecosystem members changed the last 1,5 years?

### **Results of digital product/service etc. development (if we have time)**

10. How would you evaluate the commercial impact of your digital products/services?
  - a. How has the commercial impact of digitalization changed the last 1,5 years?
11. Do you think we could ask another question which you think is important for digital transformation and organizing for digitalization? If yes what is it? and how could you answer that?



## Appendix C: Interview list Appended Paper 2

	Platform	Date	Duration	Language
<b><i>Firm South</i></b>				
Director AI lab	Online	8 October 2021	48:36	English
Director Digital Business Exploration	Online	7 October 2021	60:34	English
Product Owner Epsilon	Online	2 September 2021	68:19	English
Technical Product Owner	Online	12 October 2021	47:15	English
Product Owner Gamma	Online	4 October 2022	51:11	English
Director Digital Service	Online	21 September 2022	53:06	English
<b><i>Firm North</i></b>				
VP Sales and Commercial	On-site	22 September 2022	40:02	Swedish
R&D Manager	On-site	22 September 2022	40:48	Swedish
Portfolio and Business Development Manager	Online	18 November 2022	36:00	Swedish



## Appendix D: Interview guide Appended Paper 2

### **Project background**

1. Could you explain the [program name] project?
2. How did it start, or they started? Where did the idea come from? Where did the project start? What was the intention of the project when initiated?
3. How has the project evolved? What is the current stage of the project?
4. Were there some critical moments where the future of the project was uncertain? How was that solved? What factors contributed to the uncertainty? Other challenges that you have had to overcome?

### **Organization and business aspects**

5. How did you plan the organization (structure, processes, etc.)? Any significant changes made after the plan?
6. What new business functions were developed to assist the [program name] project (sales, marketing, etc.)?
7. What kind of business model(s) do you use and how did you develop them? What business model(s) are you currently developing or exploring?

### **Ecosystems**

8. How have you collaborated internally to develop [program name]? Have you developed new internal ecosystems from this collaboration? What were the challenges in this internal collaboration?
9. How have you collaborated with external actors to develop [program name]? Have you developed new external ecosystems from this collaboration? What were the challenges in this external collaboration?

### **Digital attitudes**

10. Have you seen some differences in attitudes (top management, other divisions, etc.) between developing digital, tangible products and your digital-based solutions? Mostly barriers/challenges or support/opportunities?

### **Performance**

11. How would you evaluate the performance of [program name]? Not only monetary but also customer engagement, data collection, or other non-monetary gains?

### **Strategy**

12. How would you describe [South or North] overall digitalization strategy?
13. How do you think these projects align with this strategy?

### **Last question**

14. Is there anything you would like to add which you think has been important in the development of [program name] which we have not discussed?



# Appended papers



# Papers

The papers associated with this thesis have been removed for copyright reasons. For more details about these see:

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