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Exploring the determinants of digital transformation in its different stages in Dutch SMEs: A digital dynamic capabilities perspective

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Digital transformation (DT) has become a crucial strategic imperative for organizations seeking to thrive in the rapidly evolving business environment. While digital transformation has been extensively studied in large organizations, there remains a need for more available evidence in the context of (Dutch) SMEs and how organizations go through different DT phases. This dissertation aims to address this gap by adopting a digital dynamic capabilities perspective to explore the determinants of digital transformation in Dutch SMEs and investigate how these determinants change over the different digital transformation phases. This thesis has met these aims by integrating an extensive review of the relevant literature and implementing a qualitative study. The latter includes nine interviews with experts from different Dutch SMEs and an expert panel to validate these findings. The primary conclusions produced by this study include five internal determinants, five external determinants, three sub-capabilities, each of the sensing, seizing, transforming, and safeguarding digital dynamic capability clusters, and five desired digital transformation outcomes. 'Digital safeguarding' has emerged as a novel capability cluster focusing on skills required from the implementation onwards. In conclusion, this study has contributed to a deeper understanding of the differences in the digital transformation determinants and capabilities between large organizations and SMEs. Moreover, this thesis has identified that boundaries between the different digital transformation phases could be fading due to the continuity of digital transformation. Simultaneously, this research has practical relevance as these findings could support Dutch SMEs in navigating their digital transformations. Alternatively, the study could help Joanknecht, a Dutch financial advisory firm, improve its consultancy services. Looking ahead, future researchers should seek to validate and expand upon the presented findings.

Key words: Determinants, (adoption) barriers & drivers, digital transformation, digitalization, digital innovation, industry 4.0, (digital) dynamic capabilities.

TABLE OF CONTENTS

1	Introduction	7
2	Literature Review	10
2.1	Digital Transformation	10
2.1.1	Evolution of Digital Transformation and related concepts	10
2.1.2	Variety of Digital Transformation terminologies used throughout the literature	12
2.1.3	Defining Digital Transformation	12
2.1.4	Digital Transformation outcomes	14
2.1.5	Determinants to Digital Transformation	17
2.1.6	Determinants to Digital Transformation acting as barriers	18
2.1.7	Determinants to Digital Transformation acting as drivers	20
2.2	Small and medium-sized Enterprises & Digital Transformation	23
2.2.1	Defining Dutch SMEs	23
2.2.2	The difference between SMEs and large organizations	24
2.2.3	Digital Transformation in SMEs	24
2.3	Digital Dynamic Capabilities & Digital Transformation	28
2.3.1	Evolution of the (Digital) Dynamic Capabilities conceptualization	28
2.3.2	(Digital) Dynamic Capabilities and Digital Transformation	31
2.4	Theoretical Framework	33
2.4.1	Theoretical Digital Transformation models used in literature	33
2.4.2	The impact of Determinants and (Digital) Dynamic Capabilities throughout different DT stages	37
2.4.3	Critique on the Digital Dynamic Capabilities framework	39
3	Methodology	42
3.1	Research design	42
3.2	Data Collection	43
3.3	Data Analysis	44
3.4	Data validation & quality	44
4	Results	46
4.1	Determinants of Digital Transformation in Dutch SMEs	46
4.1.1	Internal determinants	46
4.1.2	External determinants	50
4.1.3	Determinants over the different DT phases	54

4.2 Digital dynamic capabilities	55
4.2.1 Sensing	55
4.2.2 Seizing	57
4.2.3 Transforming	58
4.2.4 A fourth phase: Digital Safeguarding	59
4.3 Digital Transformation outcomes	61
4.4 Framework re-design proposition	62
5 Discussion	65
6 Conclusion, limitations and future research directions	71
References	74
Appendices	87
Appendix 1: Interviewee information	87
Appendix 2: Interview Guide	88
Appendix 3: Code summary (determinants)	90
Appendix 4: Code summary (Capabilities)	91
Appendix 5: Expert panel information	92
Appendix 6: Interview Quotes (determinants)	93
Appendix 7: Interview Quotes (Digital dynamic capabilities)	97
Appendix 8: Interview Quotes (Desired outcomes)	102
Appendix 9: Expert panel Quotes	104
Appendix 10: Data management plan	105
Appendix 11: The use of Artificial Intelligence (AI)	106
Appendix 12: Overview of determinants mentioned in current literature	107

LIST OF FIGURES

Figure 1. Building blocks of the DT process	34
Figure 2. A Digital Transformation Framework	35
Figure 3. Framework for building digitally-enabled process innovation in process-industrial steel firms using dynamic capabilities	35
Figure 4. Building dynamic capabilities for digital transformation: A process model	37
Figure 5. Digital dynamic capabilities for Dutch SMEs	64

LIST OF TABLES

Table 1. Digital Transformation Definitions	14
Table 2. Digital Transformation Outcomes	16
Table 3. A comparison between SMEs and large organizations	25
Table 4. Dynamic Capabilities Definitions	31

1 Introduction

Recently, the concept of digital transformation (DT) has attracted an increasing amount of interest in academic circles (Vial, 2019; Hanelt et al., 2021; Matt et al., 2023) and is continuing to gain momentum with each passing year (Chawla & Goyal, 2021; Plekhanov et al., 2022). Existing academic literature has linked DT to numerous outcomes, such as corporate risk-taking ability (Tian et al., 2022), corporate innovation (Niu et al., 2023), changing consumer behaviors (Verhoef et al., 2021), the creation of an information environment (Chen et al., 2021; Wu et al., 2022), and resource management and process efficiency (Pagani & Pardo, 2017). Moreover, navigating the organization towards these desired outcomes can be achieved by formulating a digital strategy, which facilitates organizations to identify their ‘digital sweet spot’ (Hess et al., 2016). As a result, DT has evolved into a central focus on strategic leadership agendas (Fitzgerald et al., 2014; Hess et al., 2016; Singh & Hess, 2017).

Even though no organization or sector is immune to DT and its impacts (Hess et al., 2016), previous research indicates that a successful DT is hard to realize (Zhu et al., 2021), as incumbent organizations can face significant challenges (Verhoef et al., 2021). Digital technologies can disrupt the status quo in which organizations, or entire industries, operate (Skog et al., 2018). Additionally, Li et al. (2019) argue that DT is an inherently complex process requiring specific resources for organizations to leverage the potential benefits of digital technologies fully. DT distinguishes itself from traditional forms of change not only by its complexity but also by the accelerated rate at which change occurs, leading to more significant forms of environmental volatility and uncertainty (Matt et al., 2015; Loonam et al., 2018).

While the growing body of research on DT is mainly focused on large firms (Rupeika-Apoga & Petrovska, 2022), it still needs to answer how small and medium-sized enterprises (SMEs) are affected by drivers and barriers in the context of DT. While the literature on SMEs is expanding (Ghobakhloo et al., 2022), it is still relatively restricted (Cichosz et al., 2020). Looking at the current DT literature on SMEs, the positive trend in digitalization that is visible in large organizations is not yet visible among (Micro-) SMEs (Chonsawat & Sopadang, 2020). Nevertheless, SMEs can create a competitive advantage by adopting digital technologies (Teoh et al., 2022), indicating the potential value and relevance of DT for SMEs. Nevertheless, despite the potential value, the rate of Industry 4.0 digitalization among SMEs has been worryingly low, both

in developing and developed regions, as shown in academic and industrial reports (Horváth & Szabó, 2019). The low adoption rates of digital technologies among SMEs raise the question, what is restraining SMEs from capturing the value created through adopting digital technologies?

A possible answer to this question might be that, regarding SMEs, the lack of understanding of the determinants of DT explains, to some extent, the lack of digital technology adoption (Ghobakhloo & Iranmanesh, 2021). After a critical review of the literature, it has become evident that existing frameworks on DT need to be revised to fit the SME context. This conclusion can be drawn, as despite the academic recognition these frameworks have received, academics continue to indicate the existence of a research gap in understanding how SMEs can mobilize their resources to achieve a successful DT (Ghobakhloo et al., 2022; Vial, 2019; Zhu et al., 2021; Matarazzo et al., 2021).

Besides the lack of consensus on what capabilities are needed to overcome barriers or boost drivers, scholars have also failed to reach a consensus on what different stages organizations engaging in DT go through (North et al., 2020), how organizations go through the different stages (Verhoef et al., 2021) and what capabilities are required for each stage (Zhu et al., 2021). If distinct stages require different capabilities, an inquiry could arise regarding the drivers and barriers that impact the DT process within each stage.

Therefore, this research aims to explore and identify the drivers and barriers to DT in a digital dynamic capabilities (DDC) context within each stage. Specifically, this study will explore the impact of drivers and barriers on DT within Dutch SMEs and how these impacts vary across the pre-implementation, implementation, and post-implementation phases. The following research question drives the present study: *What are the key determinants that impact a digital transformation in its different phases in Dutch SMEs from a digital dynamic capabilities perspective?*

Answering this central research question could contribute to understanding the challenges and opportunities Dutch SMEs face when considering DT by providing insights into the factors that impact the success of DT initiatives. The academic contribution of this dissertation is threefold. Firstly, this research aims to build on the existing literature by addressing the lack of understanding of DT processes strictly in an SME context. Secondly, this research could enrich the understanding of the impact of determinants of DT by exploring a possible distinction between stage-specific determinants and determinants required throughout each DT stage. Lastly, this paper

refines the existing framework and extends it by introducing a fourth stage that primarily focuses on the post-implementation phase of DT. The practical relevance of this study can be found in the possibility of creating an improved understanding of DT and its determinants among practitioners. These practitioners can be managers of Dutch SMEs directly or advisory firms like Joanknecht, the organization on behalf of which this research is conducted. In this way, Joanknecht could indirectly utilize these insights to improve their services and contribute to successful DT processes among Dutch SMEs.

This research adopts the following structure to answer the central research question. Chapter 2 provides the theoretical framework for the study, in which the literature and concepts relevant to the research topic will be critically reviewed. Then, Chapter 3 elaborates on the methodology adopted for this research, including the data collection methods and data analysis techniques. Chapter 4 presents the findings of this study, retrieved from the gathered data. Next, chapter 5 synthesizes the main findings and discusses the results of this study in relation to the theoretical framework. Finally, Chapter 6 concludes this research by answering the central research question and suggesting future research directions.

Due to the limited timeframe this research is presented with, it is essential to establish clear boundaries to the scope of this study. The first boundary of this study is the primary focus on the organizational-level drivers and barriers rather than individual-level ones, as it aims to explore the adoption of digital technologies on an organizational level. The second boundary established by this research is that it only identifies the barriers and drivers of DT in Dutch SMEs without quantifying or ranking them. The third boundary is that micro-businesses will not be included in the scope of this research, as research on organizational-level factors demands a particular operational scale. Additionally, the focus on the upper SME segment better aligns with Joanknecht's target clients, improving the practical relevance of this study. Finally, the last boundary this research sets is that this study identifies which drivers and barriers exist in a DDC context without delving into how these DDCs are developed.

2 Literature Review

This chapter discusses the literature review conducted for the present study, which is structured into four main sub-chapters to present a comprehensive overview of the relevant literature. The first chapter explores the DT concept in detail, followed by the second chapter that explores the SME concept and applies this particular context to DT. Next, the digital dynamic capabilities concept and its relation to DT are discussed. Finally, the theoretical framework is presented, which includes a discussion of multiple DT frameworks before selecting the most appropriate one.

2.1 Digital Transformation

The first sub-chapter will discuss the DT concept in greater detail. This sub-chapter is divided into seven sections that each discuss a specific theme. The first section will discuss the history and evolution of DT and concepts related to the DT concept. The second section will discuss the varying concepts used in academic literature to conceptualize DT or similar concepts. The third section explores multiple definitions of (related) DT concepts before selecting the definition used for this study. Then, the outcomes of DT will be discussed, which will show why organizations should or should not embrace digital technologies. After this section, an introductory section will generally present the determinants of DT. The last two sections will go into more depth on the DT barriers and drivers.

2.1.1 Evolution of Digital Transformation and related concepts

The concept of DT has recently gained momentum in academic circles (Vial., 2019; Hanelt et al., 2021; Matt et al., 2023; Chawla & Goyal, 2021; Plekhanov et al., 2022) and has been mentioned to be a significant driver or even the ‘core engine’ behind the fourth industrial revolution, also known as the Industry 4.0 (Alcacer, 2016; Koh et al., 2019; Savastano et al., 2019). Despite the growing maturity of the research field on DT (Zhu et al., 2021), it is still poorly understood by both academics and practitioners (Parviainen et al., 2017; Lanzolla et al., 2018; Loonam et al., 2018; Vial, 2019). This study will first reflect on its origin to understand what DT currently encompasses.

IT-enabled business transformation could be viewed as the predecessor of DT and has been extensively discussed in academic literature. Venkatraman (1994), for example, published an IT-enabled business transformation model that attracted the attention of

academics. This model introduced five levels of business transformations, including evolutionary levels focused on exploitation and integration and revolutionary levels that include explorative redesigns and redefinitions. However, as elaborated in a literature review by Hanelt et al. (2021), DT diverges from past IT-enabled organizational changes in at least three ways. Firstly, DT involves other technologies, among others, the technologies in the famous SMACIT acronym (Social, Mobile, Analytics, Cloud & Internet of Things), that vary from previously adopted technologies (Bharadwaj et al., 2013). Secondly, the boundaries of changes can no longer be restricted to organizations and industries. Instead, the impact of digital technologies has extended to more prominent ecosystems of firms and industries, as well as the inclusion of customer perspective (Tilson et al., 2010). Thirdly, the consequences or outcomes transcend beyond the incremental and practice-level changes caused by past IT-enabled change processes.

A potential explanation for the fact that DT is still a poorly understood concept may be that despite the increasing attention it receives, it lacks a consensus concerning its definition and what it encompasses. The importance of DT has contributed to the rise of various definitions in academic literature (Kraus et al., 2021). DT has been viewed as a strategy, a process, a business model, and a paradigm shift by academics (Morakanyane et al., 2017). In their review of DT conceptualization, Morakanyane et al. (2017) summarize that DT is radical, disruptive, evolutionary and complex. Additionally, literature has mentioned that DT has a social, economic, organizational (Amorim et al., 2019), cultural (Udo et al., 2016), technological (Nambisan et al., 2017) and people dimension, which would require a multidisciplinary perspective when approaching DT (Verhoef et al., 2021). Of these dimensions, the ‘people’ dimension is deemed the most essential (Vial, 2019). Verhoef et al. (2021) argue that the IS literature has paid strong attention to technical development, while Rogers (2016) suggests that DT is not about technology but strategy. Vial (2019) agrees with Roger’s perspective, as DT is not concerned with the rate at which technology evolves but rather the rate at which people can adapt to this.

While approaching a concept from different perspectives (information systems research, strategic management, supply chain management) can lead to valuable insights, it has simultaneously led to a broad range of slightly varying definitions proposed by researchers. Ultimately, this has resulted in a highly fragmented conceptualization, which resulted in a significant challenge for academics and practitioners to navigate and comprehend the nature of DT (Sousa-Zomer et al., 2020).

2.1.2 Variety of Digital Transformation terminologies used throughout the literature

In order to successfully comprehend the DT concept, it is vital to navigate the innumerable DT definitions that have emerged within academic literature. Firstly, a critical review of the extensive yet diverse academic literature reveals that academics adopt a diverging vocabulary to describe digital transformation, as terms like digitalization, digital disruption, digital innovation, and Industry 4.0 adoption are often used interchangeably (Mergel et al., 2019; Amorim et al., 2019). As a result, there is still no agreement on what DT exactly is (Warner & Wäger, 2019).

In contrast to the fragmentation of the DT concept, several authors have made significant efforts to consolidate the DT research field by making a distinction between terminologies or by integrating different proposed definitions. For example, in their systematic literature review, Matt et al. (2023) conclude that digitalization has a different scope than industry 4.0 adoption. More specifically, the scope of digitalization exceeds that of Industry 4.0 adoption because it refers to a more extensive set of inherently less complex technologies. In contrast, Industry 4.0 mainly focuses on complex and disruptive technologies applied to the manufacturing industry.

Similarly, Eller et al. (2020) contribute to the synthesis of concepts by concluding that there is a consensus on the first phase of a DT, known as digitization. Digitization is understood to be the transition of analogue data into digital form. Correspondingly, Verhoef et al. (2021) have proposed an extension to the DT 'phases' by suggesting that digitization, as the first phase, is followed by the second phase, defined as digitalization. Lastly, digital transformation follows as the most pervasive and complex phase. They present each phase as a prerequisite to the following phase, Eller et al. (2020) illustrate this as the 'walking before you can run' phenomenon. However, the distinction between digitalization and DT is not commonly accepted among all researchers. While Verhoef et al. (2021) exclusively reserve transformative effects and business model innovation for the DT phase, Autio et al. (2018) also assign these effects to digitalization.

2.1.3 Defining Digital Transformation

In order to establish conceptual clarity, a critical evaluation of DT definitions proposed in relevant literature is undertaken, in which this research ultimately identifies a definition that best encapsulates the concept of DT to provide a solid foundation for the

current study. Some definitions do not define DT but have been included to indicate the close resemblance between the DT concept and other IT-enabled change concepts. The definitions that have been considered are displayed in Table 1.

As visible from Table 1, definitions for digitalization, three definitions for DT and one digital innovation definition are included. Despite several similarities between these proposed concepts, they describe different concepts. The first similarity between the concept definitions is that the use of (a combination of) IT plays a pivotal role. The second similarity is that most definitions also describe the intended outcome of the process/change. The first significant difference between these concept definitions is the scope or boundary of the impact, where only Vial (2019) and Morley et al. (2018) propose a scope that exceeds organizational boundaries, which seems to be in line with other research that suggests that DT has the potential to disrupt the status quo of entire industries (Skog et al., 2018). The second difference between the concept definitions is that Fitzgerald et al. (2014) and Morley et al. (2018) specify the (categories of) technologies used to enable a desired outcome. Vial (2019) purposefully differentiates its definition by not using the term ‘digital technologies’ or specific technologies, as they conclude this better addresses the extant literature.

This research defines DT as: “The use of new digital technologies to enable major business improvements” (Fitzgerald et al., 2014, p.2). This definition fits this study as it focuses on the organizational impacts in the broadest sense. It must be noted that the word ‘new’ can be interpreted in different ways. This study interprets digital technology as ‘new’ when it is new to the organization and not new to the global market *persé*. This definition demonstrates the broad nature of IT-enabled change and can be applied in different industries with different levels of digital maturity while maintaining a similar interpretation.

Additionally, most incumbent firms are more likely to use digital technologies evolutionarily instead of in a disruptive and revolutionary manner (Cavalcante et al., 2011), which is why a disruptive DT definition would not fit the context of this study. In line with this reasoning, Morakanyane et al. (2017) propose that DT nudges more towards displaying evolutionary behavior, which would allow for a more comprehensible and inclusive description. Altogether, now that a clear understanding of the DT concept for this present study has been established, the focus can be shifted towards the practical outcomes and implications of DT, which showcases its relevance.

Table 1. Digital Transformation Definitions

This table shows an overview of varying DT and DT-related definitions. The definition in bold is the one applied in this study.

Defining:	Definition:	Author(s):
Digital Innovation	Digital innovation is the use of digital technology during the process of innovating	Nambisan et al., (2017)
Digitalization	Digitalization refers to the use of digital technology, and probably digitized information, to create and harvest value in new ways	Gobble (2018)
Digitalization	Digitalization is the growing application of ICT across the economy “encompassing a range of digital technologies, concepts and trends such as artificial intelligence, the “Internet of Things” (IoT) and the Fourth Industrial Revolution”	Morley et al., (2018)
Digital Transformation	The use of new digital technologies to enable major business improvements	Fitzgerald et al., (2014)
Digital Transformation	Digital transformation is concerned with the changes digital technologies can bring about in a company’s business model, which may result in changed products or organizational structures or in the automation of processes	Hess et al., (2016)
Digital Transformation	A process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies	Vial (2019)

2.1.4 Digital Transformation outcomes

As was already visible in the abovementioned DT definitions, the concept of DT has been linked to numerous desired organizational outcomes. Existing literature has aimed to identify and organize the potential DT outcomes into meaningful clusters. Morakanyane et al. (2017) were the first to categorize DT impacts and propose a categorization that distinguishes between customer-focused and organization-focused impacts. Vial (2019) and Hanelt et al. (2021) followed with a specification of organizational impacts by distinguishing between impacts on the value creation path or business model and changes in structure or organizational design, respectively. Recently, relevant literature reviews have differentiated from previous work by including a category of external impacts (Plekhanov et al., 2022; Matt et al., 2023), indicating that DT outcomes exceed the firm’s boundaries. A summary of the existing literature on DT

outcomes can be found in Table 2. Based on the proposed categorization by previous academics, the impacts have been classified into business model changes, organizational changes, market dynamics and external factors categories. Second-order categories have been added to gain a comprehensible yet thorough perspective. A more detailed discussion of these impacts follows in the coming paragraphs.

Central in any organization is value creation, which is also a crucial output of DT (Cichosz et al., 2020). Creating value through DT can be done in several different ways. As illustrated by existing literature, value can be created through DT by realizing operational efficiencies (Vial, 2019) and cost savings (Feliciano-Cestero et al., 2023) or by improving stakeholder relationships (Plekhanov et al., 2022). Possibly, customers are the most affected stakeholder, as they are impacted through improved experiences (e.g. Skare et al., 2023), extended or enriched communication channels (Matt et al., 2023), cooperation or co-creation processes between firms and customers (Plekhanov et al., 2022) and ultimately their behaviours (Verhoef et al., 2021). Besides this, DT can also have less tangible outcomes, which include, but are not limited to, increased process transparency (Plekhanov et al., 2022), change in culture (Vial, 2019) and the development of an information environment (Chen et al., 2021; Wu et al., 2022).

In contrast to all the abovementioned outcomes, DT also has some negative outcomes that need to be addressed to comprehend the implications of this transformative process. Firstly, an increasing understanding of DT and more widespread knowledge of the positive impacts of DT might cause a negative impact in the increasingly competitive environment (Verhoef et al., 2021). This phenomenon is called ‘hypercompetition’ and could be caused by the fact that competition is no longer only between standalone firms but rather between networks of firms. Secondly, DT can cause uncertainty within organizations regarding the availability of skilled staff and managers, as organizations embracing DT require more human capital (Skare et al., 2023). Alternatively, organizations might face uncertainty regarding privacy and security issues (Vial, 2019).

Lastly, it is not evident for every DT impact whether they are harmful or positive and might be dependent on the context/environment of the organization. Changing consumer behaviours due to DT (Verhoef et al., 2021) could positively affect organizations with the resources to adapt to the changing needs but might leave those who fail to address these changes vulnerable to the competition. Additionally, Plekhanov et al. (2022) deduce that power decentralization is an interesting dynamic resulting from DT processes. Distributed manufacturing has caused the rise of the so-called ‘inverted firms’

Table 2. Digital Transformation Outcomes

DT outcomes	2nd order DT outcomes	Authors
<i>Business (Model) Transformation</i>		
Enhanced efficiency & competitive advantage	Improved corporate risk-taking ability, resource management, efficiency, cost savings, increased access to financial resources	Tian et al., 2022 ; Pagani & Pardo, 2017 ; Feliciano-Cestero et al., 2023 ; Vial, 2019 ; Skare et al., 2023 ; Teoh et al., 2022
Improved customer/stakeholder relationship	(Connected) Supply chain management, Customer engagement, customer experience, customer cooperation, new communication channels, increased transparency	Feliciano-Cestero et al., 2023; Plekhanov et al., 2022; Matt et al., 2023; Skare et al., 2023
Transformed value creation	Servitization, Value networks, digital platforms, transparent processes, new services, smart/connected/customizable products	Matt et al., 2023; Feliciano-Cestero et al., 2023; Vial, 2019; Skare et al., 2023; Hanelt et al., 2021; Plekhanov et al., 2022; Teoh et al., 2022
<i>Organizational Transformation</i>		
Change in organizational design	Structure & boundaries, culture, roles & skills, Agility & ambidexterity between exploration and exploitation Changes in Culture include: information environment, innovation/technology/data-oriented mindset, knowledge sharing, technology-focused leadership	Vial, 2019; Hanelt et al., 2021; Chen et al., 2021; Wu et al., 2022; Feliciano-Cestero et al., 2023; Plekhanov et al., 2022
<i>Market dynamics and external factors</i>		
Fewer issues with exogenous shocks	Public crises, regulatory burdens	Skare et al., 2023
Changing consumer behaviours	-	Verhoef et al., 2021
Increased availability of data	-	Hanelt et al., 2021; Vial, 2019
Increasingly competitive environment	-	Verhoef et al., 2021
Increasing uncertainty and risk	Finding/maintaining skilled staff & managers, changes in labour market security and privacy	Skare et al., 2023; Vial, 2019

(Plekhanov et al., 2022), which have acquired this name as they create their value outside the boundaries of their organization, as opposed to traditional firms, who create value

within the borders of the organization. According to the transaction cost theory, distributed production can benefit organizations through specialization or cost reductions; it could also lead to a loss of control, higher coordination costs and the externalization of knowledge.

In summary, despite the undeniable benefits of DT, organizations must remain mindful as successful implementation outcomes are not guaranteed or may come at the cost of other downsides. While the positive DT outcomes do seem to outweigh the adverse DT outcomes, careful consideration of the potential trade-off is required.

2.1.5 Determinants to Digital Transformation

As established in the previous chapters, SMEs must generate an enhanced understanding of the factors that influence the inherently complex DT process. Determinants are factors that can either aid or hinder a process. Within the DT context, Ghobakhloo et al. (2022) deduce that determinants classify as a barrier when impairing an organization to adopt digital technologies successfully. In contrast, a determinant is classified as a driver, success factor or enabler when it encourages an organization to adopt digital technologies successfully. Most determinants can act as a ‘double-edged sword’, where they unfavorably impact technology adoption if absent but favorably when present (Ghobakhloo et al., 2022). Where most prior academic contributions focus on determinants of the adoption and implementation of a single digital technology (Vogelsang et al., 2019b; Raimo et al., 2021), this dissertation will look at determinants of technologies from a holistic perspective.

Vogelsang et al. (2019a) developed an integrated DT determinants taxonomy. They outline that comparing and grouping DT barriers can be difficult, as a homogenous classification is still missing, which has hurt the comprehensibility of preceding scientific investigations on DT barriers. Academics have not picked up on this taxonomy, as it has not been utilized in other studies to the best of this researcher’s knowledge. Instead, more recent publications have proposed different taxonomies for DT determinants (Chauhan et al., 2021). Even though the most common approach to classifying DT determinants appear to be to distinct between extrinsic and intrinsic barriers (Bey et al., 2013; Jabbour et al., 2016), other scholars have categorized DT barriers and drivers into organizational, technological and environmental dimensions (Ghobakhloo et al., 2022). Even more recently, Matt et al. (2023) have distinguished between barriers into organizational, market, institutional and social & ethical levels in their literature review but acknowledge

that these are non-mutually exclusive. The following two chapters will explore and discuss the different determinants mentioned by academics by summarizing and analyzing the determinants acting as barriers and drivers. An overview of the determinants mentioned in academic literature can be found in Appendix 12.

2.1.6 Determinants to Digital Transformation acting as barriers

As priorly established, DT is an inherently complex process (Li et al., 2019), which can present organizations with many unforeseeable obstacles throughout the implementation process (Zhu et al., 2021). Numerous authors have previously studied barriers to DT and have proposed a varying amount of barriers (Argawal et al., 2019; Vogelsang et al., 2019b; Warner & Wäger, 2019; Shahi & Sinha, 2020; Chirumalla, 2021; Deepu & Ravi, 2021; Diener & Špaček, 2021), or have summarized the existing knowledge on barriers in a literature review (Favoretto et al., 2021; Matt et al., 2023).

There is a growing number of studies focussing on barriers to DT, which are often focused on the specific context of large organizations (Machado et al., 2021; Sigari et al., 2021; Stentoft et al., 2021; Rupeika-Apoga & Petrovska, 2022; Cardinali et al., 2022; Rusu et al., 2022) or organizations in the manufacturing sector (Vogelsang et al., 2019b; Herceg et al., 2020; Favoretto et al., 2021; Chirumalla, 2021; Chauhan et al., 2021; Jones et al., 2021; Stentoft et al., 2021; Matt et al., 2023). Nevertheless, several examined papers have fallen short of contributing to an enhanced comprehensive overview of these barriers by publishing lengthy lists containing redundant barriers or presenting previously found evidence as new findings (Sigari et al., 2021; Diener & Špaček, 2021).

Further demonstrating the incomprehensibility of existing literature, numerous authors have presented different barriers as the most prominent factor. Even though a lack of financing options appears to be the most frequently mentioned most significant barrier (Ramilo & Embi, 2014; Herceg et al., 2020; Rupeika-Apoga & Petrovska, 2022); culture (Westerman et al., 2019), department silo's (Sousa-Zomer et al., 2020), technology (Jones et al., 2021), lack of sense of urgency (Argawal et al., 2019) and lack of knowledge on benefits (Deepu & Ravi, 2021) have also been mentioned to be the most impactful barrier. Therefore, there seems to be no consensus on which barrier is most significant for organizations.

Accurately pinpointing which barrier has the most significant impact on an organization might be difficult, as barriers can be interrelated (Ramilo & Embi, 2014; Machado et al., 2021; Hanelt et al., 2021). Additionally, Deepu & Ravi (2021) conclude

that interrelated barriers can be divided into causal and affected. The interrelationship among barriers might partially explain the complexity of this topic, implicating that there might not be a straightforward ‘most important barrier’ as they have the potential to influence each other.

A review of published works reveals multiple themes of barriers to implementing DT. The first central internal theme in the literature is a lack of human capital (Vogelsang et al., 2019b; Shahi & Sinha, 2020; Rupeika-Apoga & Petrovska, 2022; Skare et al., 2023). This includes the lack of knowledge and skills among managers and employees and a shortage of specialists in the external labour market (Rupeika-Apoga & Petrovska, 2022). Possessing specific skills and competencies is a prerequisite to fulfilling the DT process requirements (Nguyen et al., 2015). When these skills are inadequately present, an organization may lack the IT readiness required to start a transformation, which can lead to sceptical attitudes towards the presented benefits of DT and resistance to its implementation (Stentoft et al., 2021; Matt et al., 2023). This idea is further emphasized by Herceg et al. (2020), who theorizes that digitally transforming organizations perceive their human resources as obstructing technology adoption when they lack the right competencies and skills.

The second theme of internal barriers often mentioned by academics is a lack of financial resources (Shahi & Sinha, 2020; Rupeika-Apoga & Petrovska, 2022). For example, when there is a lack of financial resources, making significant investments in digital technologies becomes harder. Moreover, it reduces the possibility of investing in employee training programs, which may decrease human capital.

Thirdly, another internal barrier identified throughout DT literature is the organizational design of firms. Rigidity, which refers to the inflexibility of organizations, is often mentioned as a DT barrier in the context of a strategy (Warner & Wäger, 2019), culture (Matt et al., 2023) or business processes (Argawal et al., 2019). In line with this, Argawal et al. (2019) generally mention ‘inappropriate organizational structure’ as a significant barrier, while other authors specifically mention a structure where teams operate in silos (Shahi & Sinha, 2020; Sousa-Zomer et al., 2020), highly hierarchical structures (Warner & Wäger, 2019) or poor collaboration between operators and employees (Sigari et al., 2021).

Then, within the organizational design, a sub-theme is the role of management and leadership, which can form a significant barrier through inexperience and unwillingness to experiment (Warner & Wäger, 2019), a lack of vision or strategy

(Argawal et al., 2019; Vogelsang et al., 2019b; Shahi & Sinha, 2020; Stentoft et al., 2021; Favoretto et al., 2021), a lack of commitment from leadership (Favoretto et al., 2021), ad-hoc problem solving (Chirumalla, 2021), sticking to traditional roles (Vogelsang et al., 2019b) or a lack of understanding of the strategic importance (Stentoft et al., 2021). A noteworthy finding by several authors is that not the perceived barriers obstruct DT but managers' lack of perceived benefits (Stentoft et al., 2021; Deepu & Ravi, 2021). Besides the role of management and the alignment on a strategic level, a lack of strategic partnerships among organizations is a significant barrier to DT. Favoretto et al. (2021) explain that this barrier can occur due to a lack of a collaborative perspective, a lack of supply chain integration or the lack of networking capabilities within an organization.

Lastly, empirical evidence suggests that several external barriers like institutional, technological developments and consumer-related developments have been mentioned to impact the adoption of DT. However, they are significantly less present than internal barriers (Chauhan et al., 2021). Nevertheless, governments support organizations by building digital infrastructures or supporting the markets for skilled labour through education, but this support is still limited (Skare et al., 2023).

2.1.7 Determinants to Digital Transformation acting as drivers

Contrary to the determinants that impair DT, other vital factors encourage organizations to transform digitally. DT drivers have yet to be thoroughly investigated with empirical evidence (Raimo et al., 2021). This sub-chapter will delve deeper into the factors that encourage DT in organizations discovered by previous academics. Similar to the barriers of DT, the research on DT drivers has yet to produce one holistic and comprehensible overview of these drivers, their categorization and their order of relevance. Moreover, consensus on the most significant driver has not been reached, as process improvements (Herceg et al., 2020; Jones et al., 2021), changing (innovative) technology (Omrani et al., 2022; Kitsios et al., 2023), pressure from stakeholders & policies (Kitsios et al., 2023) and customer demands (Jones et al., 2021) have all been discovered to be the most prominent driver. Conversely, Herceg et al. (2020) mention that financial outcomes are not seen as a driver, yet they appear to be correlated with efficiency improvements in processes. Notwithstanding the possibility that DT is driven through the organization's pursuit of increased efficiency and accuracy (Cardinali et al., 2022), with financial outcomes just being a favourable derivative. Additionally, it is noteworthy that process improvements (Herceg et al., 2020; Jones et al., 2021) and workplace

improvements (Jones et al., 2021) are considered to be significant drivers, while these factors could also be viewed as DT outcomes.

A critical review of relevant literature on DT drivers reveals several recurring themes or similarities. Firstly, several academics have emphasized the role of management and leadership as an internal driver of DT. Management and leadership play an important role in driving DT. Managers and leadership have the potential to catalyse DT when they are curious about it (Matarazzo et al., 2021), supportive of it (Vogelsang et al., 2018; Feliciano-Cestero et al., 2023) or committed to DT (Machado et al., 2021). Moreover, they are more likely to drive DT when the management team is diverse (Matarazzo et al., 2021) and digitally savvy (Sousa-Zomer et al., 2020) and create a digital strategy (Eller et al., 2020), preferably one aligned with the business strategy (Machado et al., 2021). Thus, management and leadership drive DT through their attitudes, skills and actions.

Hanelt et al. (2021) pursued the necessary leadership skills in greater detail and asserted three critical skills involving specific attributes or capabilities. The first skill is DT awareness, which implies that managers should not only reactively observe and respond to changes but be proactively aware of the available data, emerging digital technologies, and their properties. The second important skill is DT acceleration, which refers to utilizing the leaders' intellectual capacity to constantly generate novel digital opportunities based on the available resources. The third important skill is DT harmonizing, which comprises the capabilities that enable leaders to integrate the physical and digital business units and their underlying processes, paying close attention to potential synergies and tensions.

The second internal driver that numerous scientific contributors have mentioned is how the businesses are structured (organizational design) and how the value is delivered to the customer (business model). Culture is an integral part of the organizational design. It can significantly contribute to DT success (Vogelsang et al., 2018) if the culture is young (Matarazzo et al., 2021), digital-supportive (Matt et al., 2023) and exhibits a supportive mindset towards risk-taking (Sousa-Zomer et al., 2020). More specifically, the organization can be structured to support DT in various ways. For example, working with the agile methodology and accompanying nimble and flexible structure are recurrently referenced as a driving factor of DT (Sousa-Zomer et al., 2020; Shahi & Sinha, 2020; Verhoef et al., 2021). However, not all contributions mention the agile methodology, insinuating that general restructuring can benefit DT (Matt et al., 2023). A general

restructuring drives DT as long as teams are integrated and collaborative (Shahi & Sinha, 2020) or can be characterized as interdisciplinary (Vogelsang et al., 2018).

On the contrary, multi-divisional structures, characterized by hierarchies, independent operations and specialization, have also been proven to enable DT through their decentralization of product/service development and decision-making (Sousa-Zomer et al., 2020), which indicates that structures other than the agile methodology can also thrive in a DT context.

Thirdly, stakeholders within and outside the organization have been widely recognized as internal and external factors driving DT (Shahi & Sinha, 2020; Matt et al., 2023). Overall, evidence suggests that stakeholders should be increasingly engaged and holistically integrated within the value chain (Machado et al., 2021), or rather the value network of organizations, to encourage DT. This can be achieved through external partnerships and technology-based acquisitions or investments (Sousa-Zomer et al., 2020), developing networking capabilities (Verhoef et al., 2021), Inter-firm cooperation along the supply chain or global networks (Matt et al., 2023), effective communication (Machado et al., 2021). Consequently, networks should become more transparent, standardized, customer-focused and collaborative to reap the full potential of DT (Vogelsang et al., 2018). In addition, organizations or networks could also rethink their way of delivering value to customers through servitization (Feliciano-Cestero et al., 2023) or life-cycle thinking and circular processes (Machado et al., 2021) to extract the full DT potential.

Fourthly, multiple sources highlight the role of knowledge management and acquisition as an internal driving factor of DT. DT can be enabled from an internal perspective by advanced HRM practices that aid knowledge management (Matt et al., 2023), such as training (Feliciano-Cestero et al., 2023) and knowledge sharing (Machado et al., 2021; Feliciano-Cestero et al., 2023). From an external perspective, this starts with looking for the right talent (Shahi & Sinha, 2020) or knowledge acquisition through strategic alliances, which can be crucial for long-term DT survival (Siachou et al., 2021).

Fifthly, the literature reports several external drivers related to technology, including the proper infrastructure and IT resources (Eller et al., 2020; Verhoef et al., 2021; Raimo et al., 2022; Matt et al., 2023), data-centric solutions (Machado et al., 2021), increasing availability of data (Vial, 2019), new developments in digital technologies (Matarazzo et al., 2021). Technology should be reliable, adaptable, available, relevant, usable, connectable and secure to drive DT (Vogelsang et al., 2018). The use of these

technologies is in conjunction with data. Data should flow consistently (Machado et al., 2021) and be relevant, complete and real-time to drive DT (Vogelsang et al., 2018). Additionally, even though it might be evident that the mere presence of data does not generate value, it should be utilized (Vogelsang et al., 2018).

Lastly, existing literature describes several external drivers of DT in the context of laws and regulations. These external factors are mainly institutional enablers, like reshaping institutional regulations (Cardinali et al., 2022; Matt et al., 2023), tailored education and training institutions (Matt et al., 2023) or governmental pressures (Machado et al., 2021). Besides institutional drivers, several scholars have also mentioned other driving factors from the external environment, like changing customer needs or behaviour (Vial, 2019; Warner & Wäger; Cardinali et al., 2022), the competitive landscape (Vial, 2019; Warner & Wäger, 2019), benchmarking within networks (Cardinali et al., 2022) or the recent energy crisis as a result of the war in Ukraine (Skare et al., 2023).

2.2 Small and medium-sized Enterprises & Digital Transformation

2.2.1 Defining Dutch SMEs

Within the Netherlands, micro-businesses, small enterprises and medium-sized enterprises are all categorized under the header ‘SME’. According to the Dutch Chamber of Commerce, an organization classifies as an SME when it has fewer than 250 FTEs and either a maximum annual turnover of 40 million euros or a total value of assets on the balance sheet of 20 million euros (Business.gov.nl, n.d.). This deviates from the criteria used by the European Union (EU) to categorize SMEs, as they classify an organization as an SME if it has fewer than 250 employees but either an annual turnover equal to or less than 50 million euros or a total value of assets on the balance sheet equal to or less than 42 million euros (Business.gov.nl, n.d.). Thus, by the EU regulations, SMEs can either have 10 million euros more in turnover or 22 million euros more in the total value of assets on the balance sheet, which is slightly more than double the value of total assets. In 2018, 99.9% out of 1.2 million active organizations in the Netherlands were categorized as SMEs (CBS, 2021). Moreover, Dutch SMEs account for 71% of the total employment and 62% of the total GDP in the Netherlands (StaatvanhetMKB, 2019). Therefore, SMEs can be viewed as the backbone of the Dutch economy.

2.2.2 The difference between SMEs and large organizations

It would be an oversimplification to state that the only difference between an SME and a large organization is the difference in size, turnover and assets, as it has long been established that SMEs possess distinct characteristics compared to their larger counterparts (Ghobadian & Gallea, 1997). For example, there is a significant difference in the available resources and IT expertise between large organizations and SMEs (Gutierrez et al., 2009). A comprehensive overview of the difference in characteristics between large organizations and SMEs is provided by Ghobadian and Gallea (1997, p. 8-9), which have been summarized in Table 3.

It is important to note that not all of these characteristics might still be accurate due to digitalization, globalization and the general change in market dynamics over the past 25 years. Additionally, as discussed in Curran and Blackburn (2001), summing up SME characteristics alone might prove inadequate to define SMEs due to the heterogeneity and diversity within this group of entities. Nevertheless, this overview can provide a particular guideline or general truth that may slightly differentiate from firm to firm.

A more recent study on the characteristics of SMEs, summarized in Kozłowski and Matejun (2016), identified ten general features that distinguish SMEs from larger organizations, being: low size and complexity (1), high typological diversity (2), intensive human dimension (3), low degree of formalization (4), strong interconnection between formal and informal elements (5), relative procedural and structural simplicity (6), high flexibility (7), entrepreneurial solid personalization (8), intensive decisional centralization (9) relatively frequent use of authoritarian and participative approaches (10) (Nicolescu, 2009).

2.2.3 Digital Transformation in SMEs

The increasing popularity of the DT concept has led to a flood of academic studies on the subject. While they provide much-needed clarity, they are mostly tailored towards large corporations (Eller et al., 2020) and cannot necessarily be generalized to the SME context (Machado et al., 2021).

Firstly, the difference between SMEs and large organizations has retrieved conflicting outcomes on the effects of DT and its success. Chauhan et al. (2021) & Sousa-Zomer et al. (2020) posit that the size of an organization does not significantly impact the

Table 3. A comparison between SMEs and large organizations

An adaptation of a table presented by Ghobadian and Gallear (1997, p. 8-9)

Characteristics	SMEs	Large organizations
Structure	<ul style="list-style-type: none"> • Flat with few layers • Low degree of specialization • Flexible structure • Top management close to point of delivery • Rapid response to environmental changes • High incidence of innovativeness • Unified culture 	<ul style="list-style-type: none"> • Hierarchical with layered management • High degree of specialization • Rigid structure • Top management far from point of delivery • Slow response to environmental changes • Low incidence of innovativeness • Cultural diversity
Procedures	<ul style="list-style-type: none"> • Low degree of standardization and formalization • 'gut feeling' decision making • People-dominated • Flexible and adaptable processes 	<ul style="list-style-type: none"> • High degree of standardization and formalization • Fact-based decision making • System dominated • Rigid and unadaptable processes
Behaviour	<ul style="list-style-type: none"> • Mostly Organic • Corporate mind-set 	<ul style="list-style-type: none"> • Mostly bureaucratic • Departmental/functional mind-set
Processes	<ul style="list-style-type: none"> • Simple planning & control • Informal evaluation and reporting • Result-oriented 	<ul style="list-style-type: none"> • Complex planning & control • Formal evaluation and reporting • Control-oriented
People	<ul style="list-style-type: none"> • High personal authority • Creativity encouraged • Modest human capital • Negligible resistance to change • Few internal change catalysts 	<ul style="list-style-type: none"> • Low personal authority • Creativity stifled • Ample human capital • High degree of resistance to change • Potentially many internal change catalysts
Contact	<ul style="list-style-type: none"> • Narrow span of activities • Limited external contacts • Limited customer base 	<ul style="list-style-type: none"> • Wide span of activities • Extensive external contacts • Large customer base

DT process. While several other studies did find a positive relationship between organizational size and DT performance (Shen et al., 2021) and depth of organizational transformation (Raimo et al., 2021). Likewise, Cichosz et al. (2020) elaborate that in the case of logistic service providers, larger organizations typically (aim to) have more standardized processes, which enables DT as it reduces the underlying complexity of a

transformation.

In contrast to the insignificant and positive effects of organizational size found by existing literature, other relevant studies have raised an alternative viewpoint. Eller et al. (2020) argue that SMEs possess strengths that are hard to copy for large organizations, including their innovation rate (Beliaeva et al., 2019) due to their flexibility and culture (Bouncken & Barwinski, 2020). The smallness and flexibility of SMEs might contribute to creating positive attitudes towards DT, especially if the senior management shares these views (Eller et al., 2020). Additionally, rigid (and top-down) hierarchies are less suitable for DT (Yoo et al., 2012; Dremel et al., 2017), which might indicate another advantage for smaller organizations. These contradictory findings make it hard to conclude whether DT suits SMEs or larger firms better. Nevertheless, except for Chauhan et al. (2021), there is a consensus that the difference between SMEs and large organizations impacts the transformation process.

For two relevant reasons, Stentoft et al. (2021) illustrate why DT in the context of SMEs differs from DT in the context of larger organizations. Firstly, they claim that SMEs demonstrate lower bureaucratic behaviours and are more motivated to succeed than their larger counterparts (Nooteboom, 1994). However, the timeframe of this publication has to be carefully considered and may be outdated. Secondly, SMEs must operate with limited resources (Muller & Hopf, 2017; Zach et al., 2014). In line with this, Ghobakhloo et al. (2022) add that more attention needs to be devoted to how SMEs should mobilize their limited resources to successfully adapt to the changing conditions caused by DT. This lack of understanding among scholars and practitioners may be why SMEs have fallen behind. SMEs are also insufficiently equipped to adopt new digital technologies (Omrani et al., 2022). This might explain why, despite the general positive trend of digital technology adoption, integration among (M)SMEs has remained relatively low (Chonsawat & Sopadang, 2020) or even worryingly low (Ghobakhloo et al., 2022) in both developed and developing regions (Horváth & Szabó, 2019).

SMEs' low digital technology adoption rate may exist because they have fewer financial resources than large firms (Ramilo & Embi, 2014). This could be partially caused by their limited access to public or private external funding (Rupeika-Apoga & Petrovska, 2022). Access to an external source of funding is vital for the development of SMEs (Skare et al., 2023), as it translates into the firm's development conditions (Bouwman et al., 2019). A recent trend discussed by Skare et al. (2023) is the present war in Ukraine, which has led to soaring inflation, increasing uncertainty and the

possibility of a recession. Not to mention the rising interest rates, which will only further increase the price of capital. Thus, the inherently lower resource base, in combination with the difficulties in attracting external resources, may cause SMEs to have lower DT adoption rates than large organizations.

Besides the financial constraints of SMEs, the literature has revealed several other possible causes for SMEs lagging adoption rate of digital technologies. Compared to larger organizations, issues like a lack of skills (Cichosz et al., 2020) and a lack of knowledge (Feliciano-Cestero et al., 2023) typically become more visible in SMEs. As a result, SMEs have developed a tendency or bias towards risk-averse behaviour. Their widely acknowledged constraints could explain their reluctance to engage in DT (Ghobakhloo et al., 2022). While a lack of skills and knowledge are organizational barriers, they are amplified when financial resources are lacking. When financial resources are abundantly present, these can be used to invest in training programs (Cichosz et al., 2020).

Additionally, SMEs may lag in their adoption rate of digital technologies because non-digitalized organizations have been found to experience a lower DT performance (Shen et al., 2021) or higher barriers (Brink & Packmohr, 2022). This negative feedback loop could withhold SMEs in early digitalization stages from maturing digitally, as the (perceived) benefits are more limited. SMEs often struggle to properly understand and commit to digital opportunities (Giotopoulos et al., 2017). DT technologies thrive due to their interconnected and integrated nature, so starting a DT journey might cost SMEs more than benefits them, at least in the short term. This phenomenon seems closely related to Amara's law, which explains that the short-term effects of technology tend to be overestimated, but the long-term effects tend to be underestimated. In the short run, DT raises concerns about attracting skilled employees and experienced managers, which are required for a successful DT process (Skare et al., 2023). SMEs might have been doomed as 'digital followers' of bigger firms (Matarazzo et al., 2021) due to the lack of understanding of the determinants that influence the adoption of technologies (Ghobakhloo & Iranmanesh, 2021) and the way these determinants function (Ingaldi & Ulewicz, 2020). To successfully manoeuvre through the complex DT process, there is a need to understand the barriers that hinder this process or the drivers that help SMEs overcome these barriers (Machado et al., 2021). Researchers can guide latecomers or 'digital followers' by examining these barriers and methods for overcoming them (Zhu et al., 2021).

In line with this, Skare et al. (2013) find that concerns about attracting a skilled workforce become more prominent among SMEs when they adopt digital technologies. The lack of skills becomes more apparent in SMEs due to their strict financial constraints, as larger firms typically have the ability to invest in training programs (Cichosz et al., 2020).

2.3 Digital Dynamic Capabilities & Digital Transformation

2.3.1 Evolution of the (Digital) Dynamic Capabilities conceptualization

Originating from the resource-based view (RBV) (Barney et al., 2001), the concept of dynamic capabilities was first expressed by Teece et al. (1997). The RBV is a management theory that argues that organizations that aspire to gain or expand a competitive advantage should possess valuable and rare resources. Additionally, if an organization aims to maintain its competitive advantage sustainably, then the resource should also be inimitable and non-substitutable. Resources with all these features are referred to in the literature as the acronym 'VRIN' resources.

The dynamic capabilities perspective addresses a shortcoming of the RBV, which is the static nature of the RBV theory. Where the RBV evaluates the state of resources at one point in time, dynamic capabilities represent valuable organizational skills over a period of time. Capabilities are not solely reliant on individual competencies but rather on the collaborative learning that emerges from the collectives of employees and the technological infrastructure that the firm has access to (Teece, 2012).

Moreover, other sources suggest that dynamic capabilities distinguish themselves from operational capabilities (Warner & Wäger, 2019; Matarazzo et al., 2021). Operational capabilities empower the organization in their day-to-day activities, which include logistics, accounting, human resource management, and marketing (Matarazzo et al., 2021), but are less likely to result in a sustainable competitive advantage as they are easier to replicate (Teece, 2014). Additionally, while operational capabilities aid organizations in maintaining the status quo, they could leave firms susceptible to environmental fluctuations (Helfat & Winter, 2011). In contrast, dynamic capabilities are innovation-based (Warner & Wäger, 2019) and provide greater relevance and usefulness in vibrant markets (Matarazzo et al., 2021). The dynamic capability perspective garnered the attention of academics as it guides organizations on how to gain a competitive advantage within a dynamic environment and therefore extends the perspective of the

RBV.

By introducing the concept of dynamic capabilities, Teece et al. (1997) aimed to explain how organizations achieve a sustainable competitive advantage by reshaping their resource base by continuously adapting to the changing environment. Sousa-Zomer et al. (2020) highlight two contrasting perspectives on the boundary of the dynamic capabilities framework, which are the perspective of Teece et al. (1997) and Eisenhardt and Martin (2000). Teece et al. (1997) present a broader explanation of dynamic capabilities, while Eisenhardt and Martin (2000) target specific capabilities. Additionally, Teece et al. (1997) argue that dynamic capabilities lead to a competitive advantage, but the duration of this advantage depends on the imitability of the capability. Contrary to this, Eisenhardt and Martin (2000) suggest that dynamic capabilities can result in a competitive advantage which cannot be sustained.

As the dynamic capability framework developed, a distinction was made between three main dynamic capability clusters, where Teece (2007) explicated the organization's ability to sense, seize and reconfigure/transform new opportunities. Sensing opportunities involve the "Identification, development, co-development and assessment of technological opportunities in relationship to customer needs" (Teece, 2014, p. 332). It is crucial to generate awareness beyond the immediate surroundings of the organization's operation (e.g. own supply chain and direct competitors) to detect threats from new entrants and other competitors (Teece, 2007). Essentially, organizations with adequate sensing capabilities can anticipate unanticipated opportunities for those lacking sensing capabilities. Seizing capabilities allow organizations to capture the value of previously sensed opportunities by commercializing new products, services, processes, or a combination of these factors (Teece, 2007). Organizations commonly succeed in sensing an opportunity but later fail to seize the value, in which several DT determinants can play a significant factor (Teece, 2007). Lastly, reconfiguring or transforming capabilities reflect the ability of an organization to modify its assets and structures as the environment changes (Teece, 2007). Due to the high risks and costs associated with changing routines (Teece, 2007), many organizations tend to refine their existing resource base when the environment is stable (Kindström et al., 2013) but reconfigure extensively when market dynamics radically change (Helfat et al., 2009).

The dynamic capabilities framework has been one of the most prominent subjects in strategic management research (Shen et al., 2021). More recently, it has also emerged as a common theme in information systems research. While technological advancements

have been mentioned as one of the disruptions that urge organizations to acquire dynamic capabilities, the contribution by Warner and Wäger (2019), in particular, has attracted tremendous scholarly attention. They applied dynamic capabilities to the DT context and proposed these competencies as ‘digital dynamic capabilities’. They included a digital perspective to dynamic capabilities, proposing a framework comprising digital sensing, digital seizing and digital transforming capabilities, contextual factors and DT outputs. Numerous authors have urged future researchers to study DT through the lens of dynamic capabilities (e.g. Annarelli et al., 2021; Matt et al., 2023). The dynamic nature of dynamic capabilities is consistent with the increasing rate of technological changes caused by DT, which will require organizations to continuously adapt their resources (Warner & Wäger, 2019). Organizations will increasingly rely on the intangible resources and capabilities, described as the ‘software’ of an organization (Montresor, 2009). A recent co-citation analysis on digitalization capabilities confirms that most capability foundations are IT-based (Annarelli et al., 2021).

Now that the (digital) dynamic capabilities concept and its evolution have been clarified, it can be defined. Table 4 gives an overview of dynamic capabilities definitions that are often used in current literature. This paper defines dynamic capabilities as: “... the capacity of an organization to purposefully create, extend, and modify its resource base” (Helfat et al., 2007, p. 4). This definition suits the context of this study as it broadly defines dynamic capabilities, which enables this study to apply it to the context of DT. Additionally, as it encourages consistency with the present study’s aim, this study opts for the definition proposed by Helfat et al. (2007). Moreover, this definition is used in the highly regarded paper by Warner and Wäger (2019).

Notably, the existing literature has used different terms to indicate similar concepts. This terminology includes but is not limited to digital dynamic capabilities, digital capabilities, digitalization capabilities and dynamic capabilities for DT. Moreover, dynamic capabilities have been portrayed as building blocks (Westerman et al., 2012), digital-savvy skills, digital intensity and context for (inter)action (Sousa-Zomer et al., 2020), while Teece (2007) posits dynamic capabilities as ‘microfoundations’ that can come in the form of processes, organization structures, procedures or decision rules and disciplines.

Table 4. Dynamic Capabilities Definitions

This table shows definitions of dynamic capabilities that are used in existing literature. The definition in bold is the one used by the current study

Definition	Author(s)
“The firm’s ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments”	Teece et al., 1997
“The distinct skills, processes, procedures, organizational structures, decision rules and disciplines that support the sensing, seizing and reconfiguring abilities”	Teece, 2007
“The capacity of an organization to purposefully create, extend, and modify its resource base”	Helfat et al., 2007
“Higher-level competences that determine the firm’s ability to integrate, build and reconfigure internal and external resources/competences to address, and possibly shape, rapidly changing business environments”	Teece, 2012
“Technology skills possessed or required by employees, customers and other stakeholders in different areas that can enable the organization to thrive in a digital environment”	Morakanyane et al., 2017

2.3.2 (Digital) Dynamic Capabilities and Digital Transformation

DT is a dynamic and continuous change process; to cope with this, it is essential to understand how dynamic capabilities contribute to DT and how they can be built (Vial, 2019). Numerous researchers have consistently advocated for further investigations into the relationship between the DDC and DT concepts in order to improve the understanding among scholars and practitioners (Zhu et al., 2021; Omrani et al., 2022). Literature has deemed it interesting to explore how the dynamic capabilities of an organization can offset challenges associated with this paradigm (Matt et al., 2023), as it is still not fully comprehended (Warner & Wäger, 2019), nor is it fully explored (Ellström et al., 2021). Additionally, it could be interesting to examine whether organizations compensate for or deal with missing capabilities.

Multiple studies have demonstrated a seamless alignment between DDCs and DT performance, even to the degree that they have become an imperative factor in boosting organizational performance (Ringov, 2017). In their investigation, Tortora et al. (2021) sum up the extensive body of research that substantiates the positive effects of DDC on DT, leaving little room to dispute this relationship. Moreover, organizations incapable of maturing their capabilities are prone to falling behind in the dynamic business environment (Raj et al., 2020) or perceive their lack of digital skills as the primary barrier

to engaging in DT (Alibekova et al., 2020). Compared to organizations lacking DDCs, organizations with adequate DDCs are better equipped to derive more significant insights from data (Shen et al., 2021). Nevertheless, obscurity persists regarding the causality of the relationship between DDCs and DT, as the two concepts coincide (Ellström et al., 2021). On the one hand, it has been robustly established that DDCs significantly contribute to DT performance (e.g. Annarelli et al., 2021). On the other hand, digital technology adoption significantly affects the development of DDCs (Shen et al., 2021).

Regardless of the well-established benefits of DDCs, most organizations might not presently possess the required internal resources due to the novelty of DT (Yeow et al., 2018). Developing the ability to reconfigure resources is vital, enabling the organization to access and develop new resources (Yeow et al., 2018). However, the immediate positive effects of capability development cannot be guaranteed (Wang & Ahmed, 2007). Provided that the forming of DDCs is rooted in the acquisition of digital resources (Shen et al., 2021), it is paramount for organizations to resist the urge to reverse or re-direct capability development efforts upon initial indications of failure or absence of positive outcomes, as effective development requires organizations to maintain a long-term perspective (Wang & Ahmed, 2007). Furthermore, the effects of DDCs are significantly amplified when access to digital resources is more deeply embedded and applied (Shen et al., 2021).

Existing literature has provided practitioners with directions on which capabilities to prioritize to improve their chances of a successful DT. A continuous learning environment is a prerequisite for successfully building any DDC, regardless of the specific capability (Nylén & Holmström, 2015). Firstly, networking can be an effective digital capability (Verhoef et al., 2021) since engaging in dialogues with people from different industries can offer valuable perspectives (Ellström et al., 2021). Organizations can leverage networking for knowledge acquisition by internalizing external knowledge, which is deemed a strategic DT imperative (Siachou et al., 2021). This way, networking can be applied for knowledge acquisition, which is a strategic imperative for organizations, through internalizing external knowledge. Secondly, a digital-savvy (Sousa-Zomer et al., 2020) or digitally literate (Kozanoglu & Abedin, 2021) workforce can bring many benefits to the DT project, as they do not only possess technological know-how but possess the necessary know-when and know-why of DT technologies (Kozanoglu & Abedin, 2021). Secondly, digital-savvy management and leadership play a significant role in DT success (Sousa-Zomer et al., 2020) in light of their nurturing role

in DDC development (Teece, 2012; Bendig et al., 2018). In addition to their supportive role in DDC development, the leadership of an organization must possess several vital skills (Singh & Hess, 2017), referred to as dynamic managerial capabilities (Helfat & Martin, 2015). The foundation of dynamic managerial capabilities rests upon three fundamental pillars, managerial cognition, managerial social capital and managerial human capital (Helfat & Martin, 2015). These pillars reflect the management's decision-making beliefs, formal and information relationships, knowledge, and skills, respectively. In the following chapter, the relevant frameworks will be discussed, followed by the reasoning of why these frameworks are deemed relevant for this present study and how they will be redesigned to fit the context of this study.

2.4 Theoretical Framework

2.4.1 Theoretical Digital Transformation models used in literature

The growing body of research on the DT concept has yielded several frameworks that could guide academics and practitioners. This chapter will discuss the frameworks relevant to the context of this present study and highlight why these frameworks could be relevant or lack relevance. Then, one framework will be chosen that provides a foundation for the design science compartment of this study.

Based on their number of citations, arguably one of the most well-known frameworks of the DT process is the DT process model proposed by Vial (2019), which can be seen in Figure 1. Vial (2019) proposed a DT process model that consists of numerous building blocks for the DT process. Their model indicates several global trends at an industrial or societal level and integrates these with multiple phases of the DT process on an organizational level. The relationship between these building blocks is not necessarily causal. Instead, they outline a comprehensive series of connections delineated from their critical review of the DT literature. While this process model can be praised for its comprehensiveness, its generality could also be marked as its major flaw. Their model describes what a generic process would or should look like, but their model lacks guidelines for how practitioners can successfully navigate through these phases or what they require in each stage. Therefore, this model is not satisfactorily applicable to the scope and context of this present study.

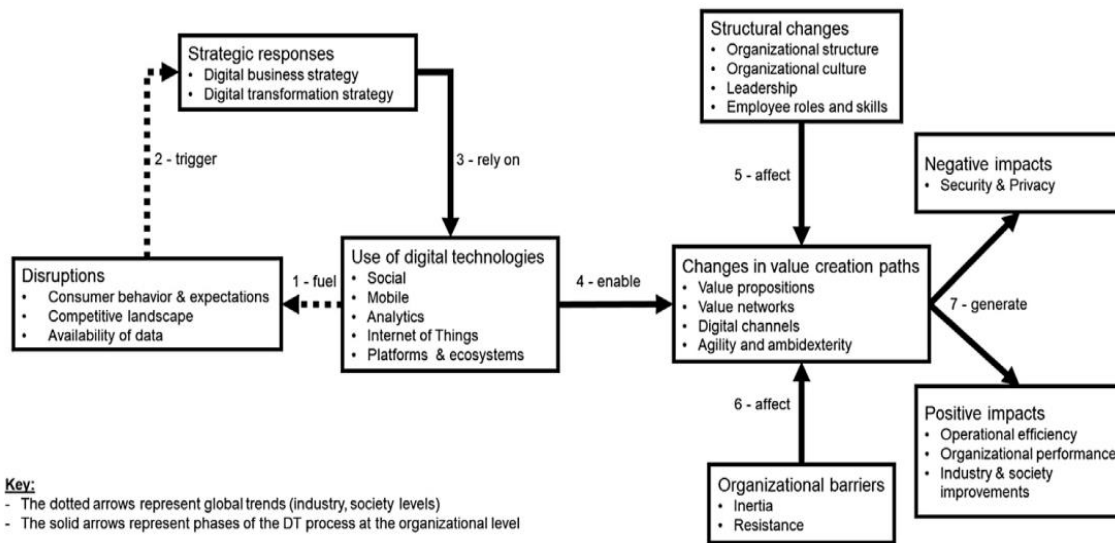


Figure 1. Building blocks of the DT process

Picture: Gregory Vial

A lesser-known alternative is the framework proposed by Favoretto et al. (2022), which is shown in Figure 2. Their framework summarizes organizational challenges in the different DT stages, focusing on manufacturing companies. In their model, they create the distinction between digitization, digitalization and digital transformation phase, providing the challenges for each stage. Moreover, they mention the role of capability development. In other words, they describe what competencies an organization might need to navigate the DT phases successfully. The biggest shortcoming of their model is the presence of some recurring challenges. For example, they mention that a significant challenge in value proposition is the ‘lack of understanding of the value from the customer’s perspective’, but they also mention ‘limited customer-based knowledge’ as a challenge in the value delivery. These challenges do not seem mutually exclusive and could therefore harm the comprehensiveness of their proposed framework. Additionally, even though the role of capability development is mentioned, the role of capabilities is only briefly relative to other relevant frameworks. Therefore, the framework proposed by Favoretto et al. (2022) does not sufficiently fit the scope and context of this current study.

A framework that does focus on the role of capabilities is shown in Figure 3, which is the framework proposed by Chirumalla (2021). They use the distinct sensing, seizing and reconfiguring clusters of capabilities, building on the dynamic capability theory introduced by Teece (2007), which could be seen as a major strength of this framework. Another strength of this framework is the comprehensive overview of micro-foundations

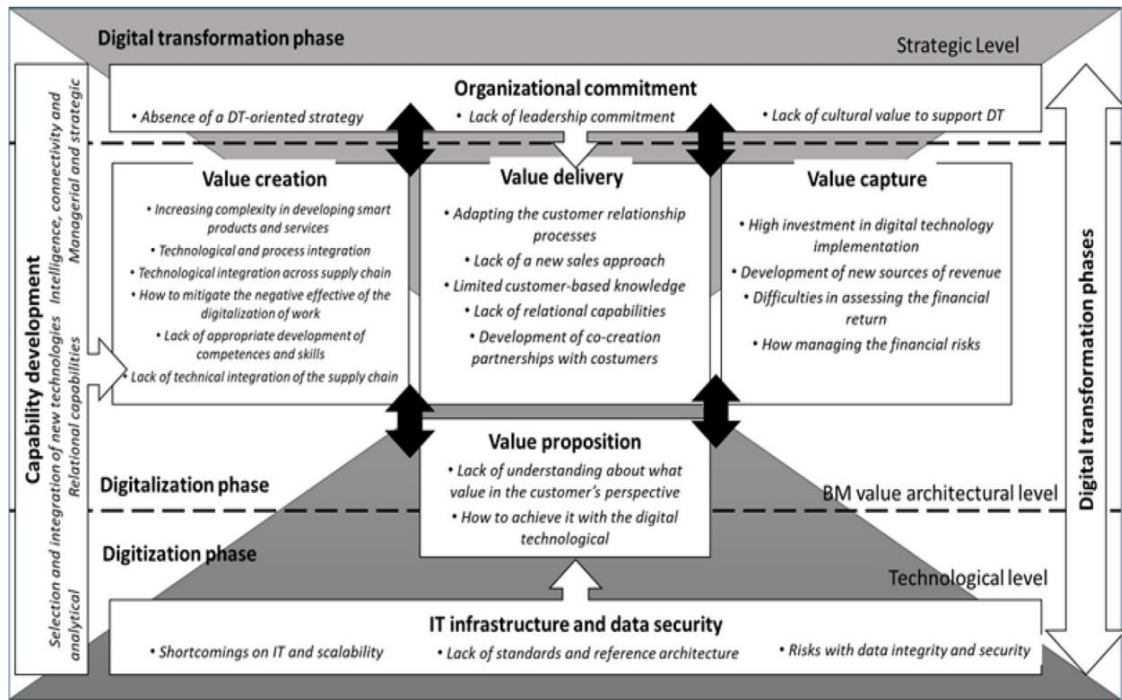


Figure 2. A Digital Transformation Framework

Picture: Camila Favoretto et al.

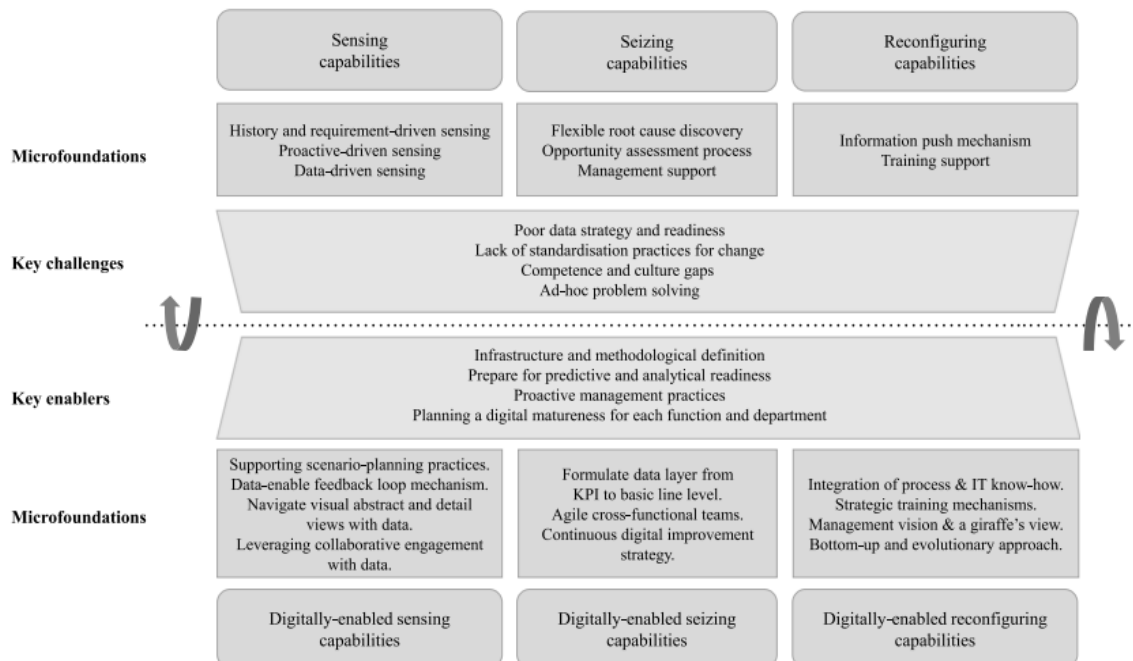


Figure 3. Framework for building digitally-enabled process innovation in process-industrial steel firms using dynamic capabilities

Picture: Koteswar Chirumalla

before and after organizations are digitally enabled. Adding to this, the framework presents critical challenges that organizations face that hinder them from becoming digitally enabled and driving factors that enable them. Conversely, a major downside of this framework is the specific context that it addresses. It focuses on digitally enabled process innovation, which could fall under, but only partially encapsulates the full scope of DT innovations. Moreover, it has been explicitly studied in the industrial steel firm sector, which may harm the generalizability of the generated micro-foundations to other branches. Hence, the framework suggested by Chirumalla (2021) does not adequately align with the scope and context of this particular study.

Lastly, the widely recognized process model by Warner and Wäger (2019), which is shown in Figure 4, will be discussed. Similar to the framework of Chirumalla (2021), the framework by Warner and Wäger (2019) expands upon the dynamic capability clusters introduced by Teece (2007). However, a significant difference to Teece (2007) is that Warner & Wäger (2019) applied it to the IS context of DT, where Teece approached dynamic capabilities from a strategic management perspective. As previously established in Chapter 2.3.2, the disruptive nature of DT is closely correlated with dynamic capabilities, which makes dynamic capabilities an interesting lens to view DT through. The DDC framework describes multiple first-order and second-order capabilities required for a successful DT process. In addition, this model pays attention to several contextual factors that influence the DT process, categorized into external triggers, internal enablers, and internal barriers. Lastly, the model shines light on several outputs of DT, making it a seemingly complete model of the DT process. The authors developed this process model based on 7 case studies within incumbent firms.

However, looking closer at the DDC framework proposed by Warner and Wäger (2019), it becomes apparent that their model might not fit (all) SMEs equally well compared to large organizations. Capabilities like rapid prototyping, balancing digital portfolios and navigating innovation ecosystems seem to insinuate a larger and well-established organization. In line with this statement, it has been generally accepted that dynamic capabilities are context- or industry-specific (Ethiraj et al., 2005). Additionally, while they claim to provide scholars and practitioners with a holistic model, their framework only presents six internal determinants. A meagre of three external ‘triggers’ or drivers are mentioned, yet no external barriers are described. When critically reviewing their contribution, it becomes apparent that they pay little attention to elaborating on how

they came up with these drivers and barriers, besides mentioning that they are grounded in senior executives' experiences.

Despite these drawbacks, this process model can be an adequate foundation for other authors to expand on or enrich by employing it in a different context. In contrast to the other examined frameworks, this specific framework demonstrates a stronger alignment with the context and scope of this present research. Therefore, this present research will use the DDC framework but challenges the claim that the process model of Warner and Wäger (2019) is holistic, especially in the context of SMEs. As a solution and to answer the central research question, this current study will re-design the digital dynamic capability framework by tailoring it to the (Dutch) SME context.

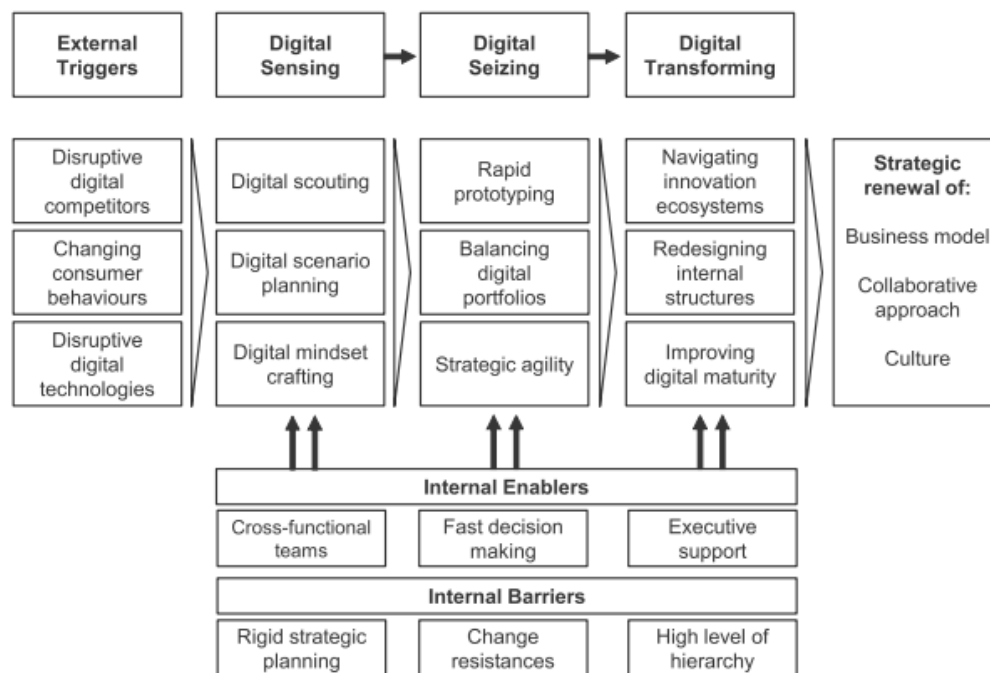


Figure 4. Building dynamic capabilities for digital transformation: A process model

Picture: Karl Warner & Maximilian Wäger

2.4.2 The impact of Determinants and (Digital) Dynamic Capabilities throughout different DT stages

Given that the DDC framework is a process model, it would imply that adopting an individual technology (within the DT journey) requires an organization to sense, seize and transform chronologically. The ‘learning to walk before you can run’ idiom would apply because organizations cannot begin to seize an opportunity they have not yet sensed. Remarkably, most authors who have written about the ‘phases’ of DT often refer

to ‘digital maturity stages’ like digitization, digitalization and digital transformation instead of these project management phases (Verhoef et al., 2021; Favoretto et al., 2022).

While academic efforts have been made to develop digital maturity stages (Büyüközkan & Güler, 2020), to this day, no clear definition for the digital stages exists (North et al., 2020), nor do the capabilities required for each of these stages (Zhu et al., 2021). At the same time, scholars have emphasized the need for future research to examine how organizations go through the different DT phases (Verhoef et al., 2021) and approach DT maturity stages from a dynamic perspective to explore how the drivers and barriers might change over time (Schumacher et al., 2016). The digital maturity concept is important in DT stages, as it is assessed from the implementation onwards, as opposed to IT readiness. This adjacent concept describes the degree to which an organization is prepared for DT before implementation (Schumacher et al., 2016). Westerman et al. (2014) suggest that digital maturity can be divided into digital capabilities and transformation management capabilities, including leadership, governance and change management skills. Organizations seeking advanced digital maturity must develop digital and transformation management components (Westerman et al., 2014).

However, when delving into the change management literature and its associated change models or frameworks, authors often focus on the stages of a single change process instead of the holistic transformation. A change model that has garnered long-standing recognition and is still regarded as one of the most powerful change management tools (Levasseur, 2001) is Lewin’s 3-stage model (Lewin, 1947). This change management model describes the three steps a change process goes through: the unfreeze-change-refreeze phases. What this model has in common with more recent change frameworks that incorporate an X amount of steps, like the ADKAR (Hiatt, 2006) or Kotter-8 (Kotter, 1996) model, is that they all accentuate a reinforcement phase. In this post-implementation phase, paying significant attention to sustaining or refreezing the change process is crucial.

Irrespective of the highly stressed importance of the post-implementation phase, this does not seem to be reflected in the DDC framework (Warner & Wäger, 2019). The importance of the integration and absorption of resources is not uniquely mentioned in change management literature, as it is also highlighted within IS literature (Singh & Sahoo, 2020). The last capability cluster in the DDC process model is ‘digital transforming’, which still insinuates a state of flux. Perhaps, the Greek philosopher Heraclitus was correct in stating that ‘change is the only constant’, especially in the

context of DT. Kane (2017) confirms that DT is not a process that will ever finish, as it is likely that the environment has already significantly shifted by the time that organizations have adapted to today's digital environment. Regardless of an organization's intentions, they must adapt, making unfreezing a substantial part of DT (Hanelt et al., 2021). This simultaneously challenges the Lewinian episodic change perspective, which states refreezing is the final step (Hanelt et al., 2021). Nevertheless, changing routines can be both costly and risky for organizations (Teece, 2007) and will ultimately only require more reconfiguration of organizational resources (Helfat et al., 2007).

2.4.3 Critique on the Digital Dynamic Capabilities framework

As previously mentioned, the DDC framework is highly regarded but might not be holistic, nor does it fit the context of SMEs. This chapter will discuss each of the main clusters of the DDC framework and how these could be expanded or differ when applied to an SME context. Firstly, when considering internal determinants for DT, the DDC framework mentions three internal drivers and three internal barriers. These determinants are cross-functional teams, fast decision-making, executive support, rigid strategic planning, change resistance and a high level of hierarchy. A few of these factors are related to the characteristics of larger firms. More specifically, high levels of hierarchy and rigid strategic planning have been established to be typical of large organizations in Chapter 2.2.2 (Ghobadian & Galleary, 1997). Therefore, it may be the case that these internal barriers are less present, or not at all, in SMEs, as they typically possess a less formal and less complex structure. Additionally, the presence of cross-functional teams might not be a prominent factor, as SMEs are likely to have less distinct teams in the first place.

Moreover, when looking at the DT literature, several internal determinants can be identified based on the retrieved themes within the literature, discussed in chapters 2.1.6 and 2.1.7, that are not mentioned in the DDC framework. A frequently discussed determinant is (a lack of) IT skills and knowledge (Vogelsang et al., 2019b; Shahi & Sinha, 2020; Rupeika-Apoga & Petrovska, 2022; Skare et al., 2023), or the knowledge management of an organization in general (Matt et al., 2023). Especially for SMEs' restricted resource base is another major determinant (Shahi & Sinha, 2020; Rupeika-Apoga & Petrovska, 2022). Additionally, the organizational design of the organization (Matt et al., 2023) and its leadership (Hanelt et al., 2021) may be two critical

determinants.

Moving on to the external determinants for DT, the DDC framework only mentions external triggers and no external barriers. The three external triggers mentioned by the DDC framework are ‘disruptive digital competitors’, ‘Changing consumer behaviors’ and ‘Disruptive digital technologies’. A few differences can be noted when comparing these factors to the DT and SME literature. The first discrepancy is the fact that no external barriers are included in the framework, but have been repeatedly suggested by numerous researchers (Manny et al., 2021; Ferrari et al., 2022; Ghobakhloo et al., 2022; Matt et al., 2023). Examples of external barriers to DT could be the shortage of IT experts in the current labour market (Rupeika-Apoga & Petrovska, 2022), the limited access to external funding (Rupeika-Apoga & Petrovska, 2022) or the increasing uncertainty resulting from the war in Ukraine (Skare et al., 2023).

Apart from these external barriers, literature also refers to institutional drivers that cannot be categorized within the three external triggers from the DDC framework (Cardinali et al., 2022; Matt et al., 2023). The relevant literature does acknowledge the existing external triggers presented by the DDC framework, such as technology (Eller et al., 2020; Verhoef et al., 2021; Raimo et al., 2022; Matt et al., 2023), competitors (Vial, 2019) and changing consumer needs (Vial, 2019; Cardinali et al., 2022) have all been mentioned. However, the competitive landscape among SMEs might be less disruptive than proposed in the framework due to their overall lower adoption rates of DT (Ghobakhloo et al., 2022).

Subsequently, the focus can be shifted towards the required capabilities for DT in SMEs. The DDC framework elaborates on the three central sensing, seizing and transforming capabilities, each with three sub-capabilities. It is evident that several sub-capabilities align with the characteristics of larger organizations but may not be in line with SMEs. The ‘balancing digital portfolios’, ‘navigating innovation ecosystems’ and ‘redesigning internal structures’ capabilities all assume a size and complexity that is not typical for an SME, making it unlikely for them to be relevant for SMEs.

The academic literature on DT suggests some other capabilities not mentioned in the DDC framework. While these are not all mentioned explicitly in the context of SMEs, networking (Verhoef et al., 2021), a digital-savvy workforce (Sousa-Zomer et al., 2020), digital know-when and know-why (Kozanoglu & Abedin, 2021), as well as digital leadership (Sousa-Zomer et al., 2020) have all been mentioned as relevant capabilities for DT.

Moreover, change management frameworks and literature emphasize the importance of a post-implementation process (Lewin, 1947; Kotter, 1996; Hiatt, 2006). This may indicate that it is relevant to include a post-implementation process as a fourth capability cluster that focuses on integrating and securing the organization from fluctuations back to a stable business environment.

Turning to DT outcomes, the DDC framework discusses the strategic renewal of business models, a collaborative approach, and culture. While these outcomes are very broadly defined, the academic literature has defined many more outcomes, as discussed in Chapter 2.1.4. For example, DT has caused several market dynamics, which are not mentioned in the DDC framework, that include fewer issues with exogenous shocks, changing consumer behaviours, increased availability of data, an increasingly competitive environment and increasing uncertainty and risk.

Lastly, the DDC framework has not considered the possibility that contextual factors or determinants change over the DT process. Dynamic capabilities can be used to offset challenges associated with DT (Matt et al., 2023). Given that it has been established that the required capabilities change over time (Zhu et al., 2021), it might be possible that the same is true for the determinants. In the same reasoning, Westerman et al. (2014) have distinguished digital maturity into digital capabilities and transformation management capabilities. It might be possible that in the pre-implementation phase, the digital capabilities offset any technological challenges. At the same time, transformation management capabilities offset challenges in the (post-) implementation phase. Existing research has urged future research to study this topic, but these calls have gone unanswered (Ellström et al., 2021). It could be that determinants are somehow affected during the DT process.

3 Methodology

This chapter describes the methodology used to explore the impact of drivers and barriers to digitalization in Dutch SMEs. This research aims to contribute to the limited understanding of DT by exploring the factors that facilitate or hinder the implementation of digital technologies in Dutch SMEs through a DDC perspective. In line with the explorative nature of this study, a qualitative research approach is adopted that fits the discovery-oriented purpose. Existing literature on DT determinants and (digital) dynamic capabilities have been critically reviewed to triangulate the primary data. First, the research method used for this study will be explained in more detail. Hereafter, the data collection and analysis will be explained. Finally, the data quality will be discussed before continuing to the findings of this study.

3.1 Research design

The current study employs a qualitative research design by conducting semi-structured interviews. Qualitative research entails a reflexive and open approach to understanding phenomena (Silverman, 2006). This fits the aim of this study, as the goal is to study the DT concept in depth and gain a deep understanding of its determinants in its different phases within the specific Dutch SME context rather than generalizing findings to a larger population.

More specifically, a semi-structured interview method is chosen because it allows the researcher to ask in-depth questions that might shed light on unexplored phenomena (Adams, 2015). Moreover, it is a valuable means for research to explore concepts (Horton et al., 2004). This suits the aim of the current study, as DT has been insufficiently researched in the context of SMEs. Moreover, semi-structured interviews have been chosen, rather than structured interviews, as they allow for more freedom to go in-depth on interesting themes, which suits the established complexity of the DT concept. Additionally, unstructured interviews were not chosen as a research method because they may reduce the answers' reliability, making it harder to compare interviews to identify common themes.

Furthermore, gathering empirical evidence, which this study does through interviews, is necessary to develop a model that captures the market dynamics and truly understands dynamic capabilities (Helfat et al., 2007) and has never been more critical given the complexity of IS phenomena (Monteiro et al., 2022). Combining design science

with the collection of empirical evidence that results in a proposal for a redesign of the DDC framework introduced by Warner and Wäger (2019) acknowledges the plea of Gurbaxani and Dunkle (2019) by providing a framework to guide SME executives in their digital transformations.

3.2 Data Collection

Hereafter, this study collected the primary data through expert interviews. Interviews are an excellent tool to gain a deeper understanding of the behaviour and experiences of experts within Dutch SMEs as it enables the collection of rich and detailed data. This present study applied a purposeful sampling approach, where the target sample consists of business and IT leaders within Dutch SMEs. In a similar fashion to previous studies (Kane et al., 2018; Cichosz et al., 2020), to qualify as a business or IT leader, the interview participant must be part of the executive level (IT) management of an SME or have decision-making rights within the organization, as this study requires an understanding of DT determinants on an organizational level. From the standpoint of convenience and busy leadership agendas, not only IT executives will be approached, but also financial (CFO), operational (COO) and business (CEO) executives of Dutch SMEs have been approached. An overview containing anonymized personal information, anonymized company information and interview duration can be found in Appendix 1. Participants are primarily identified and contacted through the professional network of 'Joanknecht'. This research conducted nine interviews in June 2023 with experts from different industries and geographical regions within the Netherlands. The average duration of an interview was 44 minutes. All interviews were held in the mother tongue of the interviewee, which was Dutch. This was done to get the richest data possible and prevent a potential language barrier. The interviews were mainly face-to-face, except for one digital interview, when the participant preferred this. The interviews were conducted following a semi-structured approach to allow for flexibility where more detail or context was deemed valuable while maintaining a predetermined set of key topics. The predetermined set of key topics and questions were mainly inspired by existing literature (Warner & Wäger, 2019; Chirumalla, 2021) and validated by the research supervisor. An overview of the interview set-up and questions can be found in the interview guide in Appendix 2. All participants have been asked for their consent to have the interview recorded, which enables the study to transcribe and digitize the interview later.

3.3 Data Analysis

Once the data had been collected, the transcription started in order to process the data in a digital form. This was done using the ‘Transkriptor’ software, followed by a review of the software output. Interview outcomes have been anonymized to create a ‘safe’ research space where interviewees feel free to speak their minds and safeguard their insights’ confidentiality. Then, the data is analyzed using a thematic analysis, where patterns and common themes within the data are identified using the ‘MAXQDA 2022’ software program. The nature of the thematic analysis was inductive, as the underexplored SME context demands an open perspective that allows for exploring new and unexpected themes. The thematic analysis involves several iterations of categorization to get holistic themes of DT determinants and required capabilities. Similar to Sigari et al. (2021), the six phases of thematic analysis proposed by Braun & Clarke (2006) were adopted. Where the researcher familiarizes with the data (1), generates initial codes (2), proceeds to search for common themes (3), reviews those themes (4), defines and names the themes (5) and finally produces a report (6). The fourth step of defining and naming the themes is where the researcher translated the findings from the interviewee’s mother tongue back to English. During these phases, the four sensibilities suggested by Monteiro et al. (2022, p. 7-8), were kept in mind. These sensibilities are: “engaging in a dialogue with the empirical setting (1), challenging assumption by looking for plausible explanations that overturn commonly accepted wisdom (2), asking how we got there (3) and lastly, making the invisible visible (4). The output and final step of the thematic analysis are discussed in the next chapter. An overview of the codes used to categorize determinants can be found in Appendix 3. Additionally, a code summary of the codes for capabilities can be found in Appendix 4.

3.4 Data validation & quality

The last step of the data analysis was validating the results through an expert panel. The expert panel approach was adopted as it is instrumental, where subjective views and complex interpretations are more informative than quantitative results (Daniel & White, 2005). This provides an excellent tool for this study, as it could address the lack of consensus among IS scholars. Additionally, it contributes to the quality of this present study as it allows experts to communicate and discuss their views, highlighting the multiplicity of perspectives within this process (Story et al., 2000; Gordon & Pease,

2006). Experts were selected based on their client-oriented role and their level of experience. The panel consisted of three individuals from the organization Joanknecht (See Appendix 5).

A few metrics were considered to enhance the quality of the results further. Starting with credibility, which refers to the trustworthiness and believability of the research findings. This research will triangulate the primary data, which consists of the interview and expert panel data, with the existing literature to verify whether the findings align with or vary from previous research. Additionally, this research aimed to reach or closely approach the saturation point in the data collection phase within a limited timeframe, which means that all new findings align with previously collected data to increase the trustworthiness of unexpected results. Next, talk about the transferability of the results or the extent to which the findings can be applied in different settings. The focus on Dutch SMEs addresses a relatively specific niche. However, generalization to a larger sample is not the aim of this research and would decrease the practical relevance for Joanknecht. Still, the results might be transferable to SMEs in other European or developed countries with similar business environments. This research aims to achieve the dependability of its results by standardizing the data collection and analysis to minimize a potential bias or inconsistency in the research process. Lastly, to address the confirmability of the results, this research adopted techniques like member checking or peer validation of the data collection and analysis to improve the credibility of the results.

4 Results

This chapter will present the research findings using the following structure. All the findings retrieved from the expert interviews and expert panel will be compared with the DDC framework proposed by Warner and Wäger (2019). This chapter will begin by establishing the determinants of DT within Dutch SMEs. This sub-chapter will discuss all the internal determinants before transitioning to the external ones. To maintain comprehensibility, drivers and barriers will be formulated as determinants, as suggested in Chapter 2.1.5, as the presence or absence often determines whether it is a driver or a barrier. This prevents a long list of factors with similar meanings yet differing directions regarding a positive or negative effect. For instance, ‘the presence of management support’ as a driver and ‘lack of management support’ as the barrier can be comprehensibly grouped under the determinant ‘management support’ to prevent redundancy. The interview quotes used to support the findings related to determinants, DDC and desired outcomes can be found in Appendix 6, 7 and 8 respectively. Additionally, relevant quotes from the expert panel are summarized in Appendix 9.

4.1 Determinants of Digital Transformation in Dutch SMEs

4.1.1 Internal determinants

Culture has been extensively mentioned as a determinant of DT in Dutch SMEs. Culture is a broad concept but has been mentioned in a few specific contexts. Multiple experts have mentioned that the organization’s culture can potentially drive DT when innovative (Interview 1). The *innovative culture* can contribute to DT if an organization’s HR department is digitally oriented (Interview 8). A *digitally-oriented HR policy* could implicate that HR focuses on recruiting a digital-savvy team or workforce.

Additionally, job rotation could be part of the HR policy, as the rotation enables people to stay focussed on improvements and new ideas (Interview 3). An innovative culture makes the organization more attractive to new personnel and clients. Another essential part of an innovative culture is that it is stimulated from the upper layer of the organization. *The support of management* can drive organizations to embrace new technologies (interview 1). Lastly, an innovative culture emerges in Dutch SMEs through a particular ‘wow effect’ when working with new technologies (Interview 4). Within Dutch SMEs with an innovative culture, people are *energized or fascinated by working*

with new technologies and seem to be emotionally driven by doing ‘cool’ things.

While it became apparent from the interviews that some organizations possess this ‘innovative DNA’, others accepted that they did not (interview 8). In these instances, the culture can form a barrier to DT when there is a *lack of top management support* (Interview 8). Moreover, firms may purposely choose to avoid DT or automation of processes, as they want to stay in touch with one another to *maintain their personal approach*. This personal approach is viewed as a core strength, which partially explains their hesitance to diverge from this culture. Illustrating this, interviewee 3 said: “*I think we should be wary of automation. We do not want to become a machine; our power lays within our personal approach*”. In contrast to the Dutch SMEs energized by DT, others lacking this innovative culture can feel drained or *experience change fatigue*. Ultimately, change fatigue can hinder DT as it (temporarily) obstructs Dutch SMEs from embracing new technologies, as it can be too much to handle for the people and the organization (Interview 2).

Finding 1:	Culture is an internal determinant for DT in Dutch SMEs.
Finding 1a:	Culture can be a driver of DT when it is innovative, which can come to expression in the form of digitally-oriented HR, top management support and fascination for working with new digital technologies.
Finding 1b:	Culture can also be a barrier to DT when the business aims to maintain its personal and informal characteristics, when there is a lack of management support, or when Dutch SMEs experience change fatigue.

Having IT and the accompanied knowledge in-house might be given for larger organizations, but this is only the case for some (Dutch) SMEs. The presence or lack of in-house IT, and IT knowledge, is an essential internal factor that can affect DT. Internal IT knowledge can drive the adoption of new technologies as it enables organizations to *quickly assist*, may any questions arise in the DT process. Interviewee 1 explained; “*Having in-house IT (Personnel) allows you to quickly provide support, I believe that is really important*”. Another driver associated with in-house IT is *outdated IT systems*. Outdated IT can encourage Dutch SMEs to embrace new digital technologies as they realize they risk being left behind if they ignore them (Interview 7).

On the contrary, it can hurt Dutch SMEs' ability to capitalize on new digital opportunities when the *in-house IT knowledge is insufficient*, which could implicate that

the organization must rely on external knowledge. (Interview 2). Relying on external knowledge can be disadvantageous for several reasons. It enables Dutch SMEs to respond quickly to questions that arise, helps to identify technological opportunities and helps to maintain a bottom line in the quality of IT.

Finding 2: In-house IT (knowledge) is an internal determinant for DT in Dutch SMEs.

Finding 2a: In-house IT (Knowledge) can be a driver of DT when old IT stimulate the organization to adapt new technologies or when IT knowledge is sufficiently present to provide support or when it enables individuals and the organization to understand new digital technologies.

Finding 2b: In-house IT (Knowledge) can be a barrier to DT when there is a lack of IT knowledge or support within a Dutch SME.

Business growth can impact the organization and is an internal determinant for DT in Dutch SMEs. SMEs have considerable growth potential due to their relatively small size. In general, the *needs of a Dutch SME can change* during growth and professionalization, in which DT can play an important role (Interview 2). In this matter, Dutch SMEs are stimulated by their business expansion, but growth can also have the opposite effect. More specifically, *the growing number of employees* in a Dutch SME can make the organization doubt whether they should engage in DT because everyone has to transition to a DT project (interview 6).

Finding 3: Business growth is an internal determinant for DT in Dutch SMEs.

Finding 3a: Business growth can be a driver of DT when it stimulates organizations to professionalize their current processes through the support of digital technologies.

Finding 3b: Business growth can be a barrier to DT when the growing number of employees is viewed as an obstruction to engage in new DT projects.

The factor mentioned the most throughout the interviews is the effect of *engagement through communication*. *Involving employees and communicating* why an organization adopts a new digital technology plays an important role (Interview 2). Four common themes within the cluster of engagement through communication are noticeable from the data: the visibility of progress, the knowledge to change, the

motivation to change, and informal communication channels. *Informal communication channels* have been visible among almost all participant organizations, and these *short communication lines* have been indicated as an advantage for DT processes. The relevance of communication in general is emphasized by interviewee 3: “*Communication is the absolute number 1. Proper communication and explanation will allow you to convince people in a positive way*”.

Out of these themes, *the motivation to change* has been mentioned the most and appears to be the most significant determinant. Motivating to change can be a critical DT driver. The transformation can be accelerated if employees are presented with *the noticeable benefits* of a new technology (Interview 1). In line with this, *conveying the value or urgency* in a way that people understand the purpose can also benefit the DT process (Interview 1).

While this may be true, multiple factors negatively impact the motivation to change within Dutch SMEs. When an organization fails to convey value and urgency, the *lack of drivers or sense of urgency* can be noticed (Interview 5). Since change is often perceived as challenging, Dutch SMEs notice that their employees tend to slip back into *old ways of working* (Interview 2). Additionally, organizations might struggle to *balance their exploration and exploitation efforts*. Prioritization of exploitation efforts within Dutch SMEs can also hinder DT (interview 7).

Besides the *motivation to change*, people should also have the knowledge to change, which has proven to be another determinant of DT in Dutch SMEs. *Knowledge sharing* is essential to spread knowledge within Dutch SMEs (Interview 4). Another factor that could play a role in the knowledge to change is *training*. This is important in the context of DT, as insufficient training can create a barrier to adopting new digital technologies (interview 7).

In terms of *visibility of progress*, Dutch SMEs can be driven if progress is noticed in the short term (Interview 4). On the contrary, people can lose their enthusiasm if *DT projects linger on without significant progress* (interview 7). Moreover, suppose the *goal of the DT project is not clear* for every individual or *is not aligned* with the business strategy. In that case, a barrier may form towards adopting new digital technologies (Interview 4).

Finding 4: Engagement through communication is an internal determinant for DT in Dutch SMEs. Engagement through communication can come to

expression in visibility of progress, knowledge to change, and motivation to change.

Finding 4a: Engagement and communication can be a driver of DT when there is visible progress or success, when knowledge is shared, when the value and urgency is conveyed, when it improves the current working conditions or when informal communication channels are utilized.

Finding 4b: Engagement and communication can be a barrier to DT when projects take too long, when there is a lack of vision, a lack of training, employees fall back in old ways of working, a lack of drivers.

Lastly, “*It always comes down to money*” perfectly introduces another widely recognized internal determinant for DT among Dutch SMEs (interview 6). After conducting the interviews, it became evident that *financial resources* are an internal determinant for DT in Dutch SMEs. Financial resources are a transparent barrier and have only been mentioned to drive DT in a hypothetical context. Even though *financial resources* might not be visible in every Dutch SME, access to financial resources is more restricted than in large organizations (Interview 9).

Finding 5: Financial resources are an internal determinant for DT in Dutch SMEs.

Finding 5a: Financial resources could drive DT when present, they are predominantly mentioned to insufficiently present, forming a barrier to DT.

4.1.2 External determinants

Continuing with the factors outside the control of organizations, *macro-economic disruptions* mentioned throughout multiple interviews is the *structural labour shortage* and has therefore been determined to be an external determinant of DT in Dutch SMEs. Due to the labour shortage, SMEs are forced to educate employees themselves (Interview 2). The labour shortage has the potential to drive organizations to innovate. Multiple experts consider innovative SMEs more attractive for future employees, which may incentivize Dutch SMEs to embrace DT, interviewee 1 states: “*Additionally, considering the labour market, if you show that you are a progressive organization, then people want to come work for you. That is also an incentive to do it [DT]*”. Likewise, the

disruption that the *COVID-19 pandemic* caused has significantly increased the rate at which new digital technologies were adopted, as Dutch SMEs, at least temporarily, had no other option but to work digitally. After the pandemic, numerous Dutch SMEs realized they could continue extracting value from these technologies (Interview 6).

Moreover, it can stimulate Dutch SMEs to explore automation or robotization, as the shift from manual labour towards machinery and robots and the associated productivity boosts would limit the dependability on human resources (Interview 8). While some interviewees have mentioned the labour shortage as a driver, others view it as a barrier to DT in Dutch SMEs. The labour shortage makes it harder to attract digital talent, which could hinder further adoption (Interview 5).

Additionally, besides the insights from the interviewees, the role of external capital was mentioned by the expert panel as a potential determinant (Expert 2). After discussing the lack of financial resources as an internal determinant, the experts were surprised that external access to resources was not mentioned as an external determinant. While the role of external resources had been mentioned in interview 1, it had not been included as this was the only interview to mention external capital. The expert panel mentioned that the rising interest rates and shrinking subsidies from the government make it significantly harder for Dutch SMEs to attract external funding. Therefore, access to external capital could be included as an external determinant of DT in Dutch SMEs within the macro-economic disruptions cluster.

The expert panel were not surprised that sustainability was not mentioned during the interview, but they expect this to become a driver of DT in the near future (Expert 3). Additionally, they stated that sustainability would more likely be mentioned in large organizations, but sustainability has not been included, as no interviewee mentioned it.

Finding 6: Macro-economic disruptions are an external determinant to DT in Dutch SMEs.

Finding 6a: Macro-economic disruptions can drive DT when it, the labour shortage stimulates organizations to automate their business processes or when a pandemic forces Dutch SMEs to work digitally.

Finding 6b: Macro-economic disruptions can be a barrier to DT when the labour shortage hinders organizations to acquire the digital-savvy human capital that they require for DT or by restricting the access to external capital through a rise in inflation and interest rates.

Another factor outside Dutch SMEs' control is that organizations have to operate within the established institutional parameters. *Laws and regulations* have been extensively mentioned throughout the interviews and identified as an external determinant of DT in Dutch SMEs. New laws and regulations that increase the administrative load could nudge Dutch SMEs towards DT (Interview 9). More specifically, AI or automation could aid Dutch SMEs in handling this increased administrative load. On the other side, laws and regulations could also make it more challenging to extract value from digital technologies (Interview 4). Laws and regulations could limit the potential value of DT when they complicate the DT process, like with data regulations.

- Finding 7:** Laws and regulations are an external determinant to DT in Dutch SMEs.
- Finding 7a:** Laws and regulations can drive DT when they stimulate or obligate Dutch SMEs to adopt new digital technologies.
- Finding 7b:** Laws and regulations can be a barrier to DT when they withhold or prohibit Dutch SMEs from adopting new digital technologies.

A recurring theme throughout some interviews was the safety of the digital business environment. *Cybersecurity* is receiving growing attention in Dutch SMEs due to the increasing ransomware attacks in the news, where organizations are digitally held hostage. To prevent this, Dutch SMEs can be motivated to adopt new digital technologies to *arm themselves against these digital threats*. To minimize any risk, a cybersecurity policy can solve these incoming threats. However, a certain maturity of the IT systems is required to be eligible for a cybersecurity policy. This could motivate Dutch SMEs to revisit their IT resources, ultimately leading to DT (Interview 7). However, the need for certainty may also hinder DT, as Dutch SMEs want *assurance of a technologies' safety* before implementing it (Interview 9).

- Finding 8:** Cybersecurity is an external determinant to DT in Dutch SMEs.
- Finding 8a:** Cybersecurity can be a driver to DT when new digital technologies provide better protection against cybersecurity threats.

Finding 8b: Cybersecurity can be a barrier to DT when there is uncertainty about the safety of new digital technologies.

The disruptive development of digital technologies might be the main reason for DT's rising popularity among businesses. As confirmed throughout the interviews, disruptive digital technologies are an external determinant of DT in Dutch SMEs. Large organizations like Microsoft, Google and Apple, who develop many technologies, often determine the course that smaller organizations are heading (Interview 1). Dutch SMEs are becoming increasingly more convinced to embrace technologies as they are *continuously improved* and deprived of their initial teething problems. An essential requirement, however, is that new digital technologies are *compatible* with other IT systems, as integration possibilities can be of high value (Interview 5). In continuation of working more digitally is the *increasing availability and collection of data*. Data have been mentioned to be 'the new gold' (Interview 2) and enable Dutch SMEs to improve or execute operational goals (Interview 8). A downside to these disruptive digital technologies is that the accelerated rate of *technological advancements surpasses Dutch SMEs' capacity to adopt*, creating a potential barrier to DT if organizations start to fall behind. As interviewee 5 puts it: "*The organization cannot keep up with the speed [of technological developments] in the current market*".

Finding 9: Disruptive digital technologies are an external determinant to DT in Dutch SMEs.

Finding 9a: Disruptive digital technologies can be driver of DT when Dutch SMEs want to improve their existing systems, when they benefit from the development of newly adopted digital technologies, or when data is more accessible.

Finding 9b: Disruptive digital technologies can be a barrier to DT when the rate of development of digital technologies is faster than the ability of Dutch SMEs to follow.

Besides technological development, *the perspective of the business environment* has also been revealed to be a critical external determinant of DT in Dutch SMEs. The business environment can drive DT if other *competitors* extract value from new digital technologies. This forces Dutch SMEs to move with the market, as they risk

falling behind and becoming expendable by competitors (Interview 6). Equally, if the entire *value chain overlooks the potential* of new digital technologies, then Dutch SMEs can feel less inclined to explore the possibilities themselves (Interview 8).

- Finding 10:** The perspective of the business environment on DT is an external determinant to DT in Dutch SMEs.
- Finding 10a:** The perspective of the business environment on DT can be a driver of DT when digital competitors start to benefit from new digital technologies.
- Finding 10b:** The perspective of the business environment on DT can be a barrier to DT when the value chain does not encourage Dutch SMEs to adopt new digital technologies.

4.1.3 Determinants over the different DT phases

As this study aimed to explore how determinants affect DT over its different phases, a few interview questions were explicitly devoted to this context. The aim was to discover if there were any noticeable differences between determinants in the pre-implementation, implementation and post-implementation phases. For the pre-implementation phase, most determinants were related to the assessment of options, like technology functionalities (Interview 5) and whether the management supports the allocation (Interview 8) of sufficient human and financial resources (Interview 1). During the implementation phase, most determinants mentioned by the interviewees are related to the adoption and use of the technology (Interviews 1 & 3) or the engagement of stakeholders (Interview 8). In the post-implementation phase, the most notable theme was paying attention to the users (Interview 1) and celebrating success (Interview 4). A noteworthy comment about the post-implementation phase was the observation that every post-implementation is connected to the pre-implementation of the next project, indicating a dependency between these phases. Interviewee 4 observes: “*Every project in the post-implementation has a direct impact on the pre-implementation*”.

The fact that the engagement is mentioned in multiple phases indicates that this determinant is not predominantly prominent in one distinct phase. Moreover, several interviewees explained that determinants do not become less important over DT’s phases (Interview 3) or that the drivers apply to every DT phase (Interview 7). Thus, despite the

suggestions made by several interviews, the evidence supporting that determinants differ across DT's phases appears too limited to be presented as conclusive.

Finding 11:	Determinants of DT in Dutch SMEs are not noticeably different across the different DT phases.
Finding 11a:	There are no determinants that are specifically noticeable in the pre-implementation phase.
Finding 11b:	There are no determinants that are specifically noticeable in the implementation phase.
Finding 11c:	There are no determinants that are specifically noticeable in the post-implementation phase.

4.2 Digital dynamic capabilities

4.2.1 Sensing

The first step in the DT process model is to identify and understand digital opportunities and threats, known as sensing capabilities. A pre-implementation phase characterizes this step, as it prepares Dutch SMEs for future projects. This process mainly happens naturally in Dutch SMEs, as most interviewees indicated they had no formal procedures to approach the sensing process (Interview 4). Similarly, Dutch SMEs often try to understand new technologies through experimentation in an ad-hoc manner instead of a strategized process (Interview 9). Three clusters of sensing capabilities have been identified, which will be discussed below. These clusters can be categorized as digital scouting capabilities, digital business case development and digital roadmapping.

Starting with *digital scouting capabilities*, it has been found that opportunities are discovered through a combination of three digital scouting sub-capabilities. The first sub-capability is scouting through knowledge sharing within Dutch SMEs. Knowledge sharing is perceived as more effective when done in a personal and informal manner, which is enabled by the relatively small size of SMEs that allows executives to speak with everyone in the firm (interview 6). Sharing knowledge with people within the organization can prevent tunnel vision among employees (Interview 4) while simultaneously contributing to a shared and multidisciplinary perspective that allows people to identify business opportunities at a faster rate (Interview 4). In line with this is the second sub-theme, which is job rotation. Job rotation has been mentioned to enable

innovation to stay at the top of employees' minds (Interview 3). Lastly, scouting digital opportunities and threats requires digital networking capabilities, as it has been determined that Dutch SMEs often rely on external knowledge. The network of the organization can be used for scouting purposes through conversations with competitors (Interview 3), through specialists or IT partners (Interview 7), or by inviting experts from outside the organization to tell more about a specific topic (Interview 1).

Secondly, *digital business case development* has been recognized as a vital sensing capability. Given the financial constraints that SMEs have to work with, it is crucial to determine the costs and benefits of a digital opportunity in order to decide if it is worth it (Interview 1). However, the maturity of this capability still has plenty of room to mature. While most participating SMEs try to make a business case for every project step (Interview 8). It is often based on a quick estimated calculation, followed by a decision on whether they will continue or not, without reflecting on their decision at a later point in time (Interview 4). This indicates that even though most interviewees acknowledge the importance of a business case, the exact methods differ. A pragmatic approach is often implemented, where Dutch SMEs base their final decision on convenience rather than pure rationality (Interview 8).

Thirdly, it is crucial to shed light on the *digital alignment* of digital opportunities, even though results might not be immediately visible (Interview 1). When digital technology fits with the strategy, it is explainable to employees why the decision has been made to embrace DT. Interviewee 8 confirms this by stating: *“It is not just a matter of investing an X amount in a solution and figuring it out later. It needs to be part of a larger plan”*. Moreover, Dutch SMEs can use their strategic goals to reverse engineer which technologies can aid them in achieving these goals (Interview 8). While digital alignment was initially added as a seizing capability, the expert panel unanimously agreed that it should be put in the sensing category, as it is essential in the orientation phase (Expert 3).

- Finding 12:** There are three required sensing capabilities for DT in Dutch SMEs.
- Finding 12a:** Digital scouting is a required sensing capability for DT in Dutch SMEs.
- Finding 12b:** Digital business case development is a required sensing capability for DT in Dutch SMEs.
- Finding 12c:** Digital alignment is a required sensing capability for DT in Dutch SMEs.

4.2.2 Seizing

The second step in the DT process model is to capture the previously identified digital opportunities and threats, known as seizing capabilities. This step starts near the end of the pre-implementation but expands to the beginning of the implementation phase. Again, three sub-capabilities have been identified to make up the central seizing capability. The clusters discovered are digital roadmapping, digital stakeholder management and rapid piloting, which will now be elaborated on in more depth.

The first seizing capability extracted from the interviews is ***digital roadmapping***. A roadmap follows after a successful sensing phase, which states how the organization can proceed over time (Interview 1). Planning can be vital as it can prevent a lack of time, which impairs the motivation to change. More specifically, a roadmap can prevent the organization from underestimating the amount of work it requires from the people involved (interview 7). A digital roadmap can act as a clear framework that often comes as a timeline (Interview 6) or timetable (Interview 8).

The second seizing capability distilled from the interviews is ***digital stakeholder management***. Stakeholder management is important for DT in Dutch SMEs as it allows organizations to identify those that will be affected by the transformation, inside and outside the firm. This can be done through a stakeholder analysis and ensures that all relevant parties are involved in the implementation phase. It aids Dutch SMEs in recognizing who the relevant stakeholder is, discovering their opinions, and identifying roles in which they could contribute to the transformation (Interview 2). Stakeholders engaged throughout the process have been reported to be more positive towards the DT outcome. When stakeholders have had the opportunity to share their opinions and see that actions have been taken based on their advice can work favourably for the adoption (Interview 7).

The third seizing capability synthesized from the interviews is ***rapid*** piloting. *Piloting* a technology in smaller groups allows Dutch SMEs to resolve any potential teething problems before implementing it in the entire organization. This can contribute to a successful DT process. It allows the organization to respond more effectively to questions that arise during the company-wide implementation (Interview 3). Interviewee 1 explains the relevance of having a diverse sample from the organization: “*Then, we make sure that people from the organization are invited, so that you can pilot it with a reasonable cross-section of the organization*”.

- Finding 13:** There are three required seizing capabilities for DT in Dutch SMEs.
- Finding 13a:** Digital roadmapping is a required seizing capability for DT in Dutch SMEs.
- Finding 13b:** Digital stakeholder management is a required seizing capability for DT in Dutch SMEs.
- Finding 13c:** Rapid piloting is a required seizing capability for DT in Dutch SMEs.

4.2.3 Transforming

The third step in the DT process model is where the digital opportunities and threats are, known as transforming capabilities. This step starts in the implementation but can transcend to the post-implementation phase. Again, three sub-capabilities make up the central seizing capability. The clusters that have been detected are digital ownership crafting, digital know-how and know-why training and navigating innovation networks, which will be explained in greater detail.

Digital ownership crafting is essential during transformations by appointing one or several people responsible for the transformation project (interview 9). It has been observed in multiple interviews that crafting digital ownership is vital as it creates accountability within the organization. Without accountability, Dutch SMEs can experience a scenario where everybody prioritizes their day-to-day work, so without digital ownership, the chances of DT success are reported to be lower (Interview 1). The dedicated project owner can be different based on the required expertise, but having a dedicated project leader within the organization can make a notable difference, as mentioned by interviewee 2: “...*We have opted for a project leader, and we can see that it is making a difference*”.

Another important transforming capability, as visible from the interview data, is *digital know-how and know-why training* of all the affected stakeholders. Training programs are important for people to learn how to work effectively with new digital technology (interview 8). Dutch SMEs should realize that, depending on the technology’s impact, training programs can take weeks and rarely are completed in one day or session (Interview 7). Besides training the stakeholders in how they should do things, it is essential not to overlook the know-why. Explaining why the organization is adopting technology is crucial to understanding the importance of a successful DT process and outcome (Interview 9).

The last transforming capability retrieved from the interview data is *navigating innovation networks*. While networking has been previously mentioned as a scouting sub-capability, a clear distinction can be made between the sensing and transforming capability related to networks. Navigating innovation networks is utilizing or exploiting resources outside the organizational boundaries but within the network. Dutch SMEs can use resources made available to them by their network (Interview 2) or by using them as a form of external support to compensate for the lack of in-house knowledge (Interview 5). The power of a network, compared to having a single IT partner, is that it could allow an independent party to operate as an intermediary who views the DT process through the perspective and interest of the Dutch SME. This way, an SME can prevent IT providers from ‘marking their own homework’ (Interview 7). Nevertheless, Dutch SMEs ideally have someone in-house with sufficient skills to navigate the innovation network, as an internal member is likely to be more involved with the firm and better understands the requirements (interview 6).

Finding 14:	There are three required transforming capabilities for DT in Dutch SMEs.
Finding 14a:	Digital ownership crafting is a required transforming capability for DT in Dutch SMEs.
Finding 14b:	Digital know-how & know-why training is a required transforming capability for DT in Dutch SMEs.
Finding 14c:	Navigating innovation networks is a required transforming capability for DT in Dutch SMEs.

4.2.4 A fourth phase: Digital Safeguarding

Lastly, a fourth phase in the DT process, *digital safeguarding*, has been added based on the data gathered from the interviews. In this phase, integrating the newly adopted technology is central and allows Dutch SMEs to secure the value of DT by navigating back to a state of stability. Therefore, it is primarily present in the post-implementation phase of a transformation. Even though it has been mentioned that transformation is the only constant, the nuance has been made that organizations simultaneously strive for a stable business environment, as a constant state of flux can become unmanageable, which may be even more true for organizations characterized by

a lack of procedures.

Besides the interview data, one expert recognized that the DDC framework (Warner & Wäger, 2019) has similarities with the change management model, ADKAR (Expert 3). The expert brought this up before the newly found fourth ‘digital safeguarding’ capability was introduced. The fact that experts see the link between the DDC framework and change management models could validate the newly introduced fourth capability.

The first required safeguarding capability is *digital milestone management*. Project management is a vital part in this, as it requires Dutch SMEs to make agreements for the DT project (Interview 1). Different methods of project management were acknowledged as helpful during the interviews. The agile methodology has been mentioned in the context of using small sprints (Interview 3). These sprints partition a large project into smaller milestones. Another method mentioned is the lean approach, where a problem is identified, analyzed and solved. Working in short iterative cycles allows everyone to notice progress (Interview 4). Moreover, once the milestones have been reached, it is essential to celebrate these successes to accelerate the transformation further.

The second safeguarding capability for Dutch SMEs is *digital support*. It has been recognized as important to have people available that can swiftly and directly be approached in case of any questions. People who have already gained experience in the pilot can be designated as experts that could provide this support (Interview 1). Alternatively, a third party could provide support if the required knowledge is absent within a Dutch SME (Interview 7). That way, it does not hinder the employees’ work process, as they can continue to work smoothly (Interview 9).

The last safeguarding capability concerns *digital feedback management*. It is essential to ask stakeholders their views on new digital technologies. Thinking that everything is acceptable considering the adoption as long as there are no complaints can be a pitfall, as the absence of complaints does not equal the actual use of technology (Interview 8). This could lead to identifying potential issues that can later be resolved to prevent barriers from forming (Interview 1). A popular method for feedback collection is surveys or questionnaires. However, following up on the survey outcomes is very important as it increases the response rates (Interview 3). Regardless, surveys could only yield desired answers, so a softer and more human approach, by listening to what people have to say in informal conversation, could provide more benefits (interview 2). SMEs

are perfectly organized for collecting feedback in informal ways, as illustrated by interviewee 9: “*We have short lines of communication. Even though we have 80 employees, we all interact with each other. There is no significant hierarchy, so if something is not right, I usually hear about it directly*”.

Finding 15:	There are three required safeguarding capabilities for DT in Dutch SMEs.
Finding 15a:	Digital Milestone management is a required safeguarding capability for DT in Dutch SMEs.
Finding 15b:	Digital supporting is a required safeguarding capability for DT in Dutch SMEs.
Finding 15c:	Digital feedback management is a required safeguarding capability for DT in Dutch SMEs.

4.3 Digital Transformation outcomes

As discussed above, Dutch SMEs indicate that there must be a business case for them to embrace DT. Several desired outcomes have been revealed based on the interview data. The first desired DT outcome is increased *cybersecurity* to protect the organization from increased threats (Interview 6). Another expert explains that the organization must balance cybersecurity and *ease of use* as a Dutch SME. However, safety and ease of use do not have to be mutually exclusive outcomes. Some technologies, such as single sign-on technologies, can make work safer and easier to use simultaneously (Interview 2). Perhaps the most mentioned desired outcome is increased *efficiency*. Working more efficiently through digital technologies creates more time for Dutch SMEs to focus on creativity or quality (Interview 4). Besides this, a more efficient process can lead to a faster time to market, which can be crucial in specific industries (Interview 4). Moreover, efficiency gains in production can also have long-term benefits to Dutch SMEs by extending the efficiency to R&D and the entire supply chain in the future (Interview 8).

Another popularly mentioned desired DT outcome is increased *insights* through digital technologies. Extracting value from the increasingly available business data allows Dutch SMEs to monitor how they have been performing or will likely perform in the future (Interview 6). These increasing insights are created through a leading strength of digital technologies, which is the integration possibility among technologies. DT can

improve the traceability of processes, enabling Dutch SMEs to analyze where mistakes are made and helping them tackle these problems (interview 8). Additionally, it provides more insights into the accuracy of the operations, reducing the chance of errors (Interview 9).

Moreover, all three experts from the expert panel agreed that they often hear the need for insights, but mainly in the context of a driving factor instead of an outcome (Experts 2). Expert 3 specifically mentioned: *“One that I would expect here [internal determinant], is the need for insights. That is often mentioned, and I do not see it here [in the preliminary findings]”*. Enhanced insights will still be categorized as a DT outcome, as this research aims to avoid viewing desired outcomes as drivers. However, an argument could be made that the need for insights is not only a DT outcome but also an internal determinant that positively affects DT when present.

The last desired outcome mentioned in the interviews is the *differentiation* opportunities through DT. Being distinctive from competitors can be beneficial in a few ways. It can make the organization more attractive to customers, as it can offer additional services through digital technologies (Interview 9). For service providers, understanding digital technologies can also contribute to service or advisory opportunities for clients, creating indirect value (Interview 1). Lastly, the differentiation through DT could also make the organization more attractive to new digital talent (Interview 9). Innovative and digital-savvy employees could search for organizations that fit this character.

Finding 16: Desired DT outcomes for Dutch SMEs are enhanced cybersecurity, user friendliness, efficiency, insights and differentiation.

4.4 Framework re-design proposition

This sub-chapter will combine all the findings into a re-design of the DDC framework (Warner & Wäger, 2019) to more accurately reflect the determinants, capabilities and desired outcomes relevant to Dutch SMEs.

The internal determinants of DT in Dutch SMEs are represented by findings 1 to 5. In line with the DDC framework, executive support and change resistance were internal determinants for SMEs. Both of these have been captured in the culture determinant. On the other hand, cross-functional teams, fast decision-making, rigid strategic planning and

a high level of hierarchy were not found to be relevant internal determinants in the Dutch SME context.

On top of this, the findings show some internal determinants that are not present in the current DDC framework. These newly discovered internal determinants include in-house IT (knowledge), business growth, engagement through communication and financial resources.

Moving on to the external determinants of DT. As proposed by the DDC framework, disruptive digital technologies have been directly found to be an external determinant of DT in Dutch SMEs. Additionally, digital competitors have been identified as a vital external determinant, yet not in a disruptive manner. Conversely, changing consumer behaviours, presented in the DDC framework, has been found in a context opposite to the original framework.

Moreover, other external determinants were not presented in the original DDC framework. These external determinants include; macro-economic disruptions, laws and regulations, cybersecurity and the perspective of the business environment. The latter includes digital competitors as well as unchanging value chain behaviours.

Subsequently, only one of the dynamic capabilities that were mentioned by the DDC framework has also been found in the current study, being digital scouting. However, multiple dynamic capabilities suggested by the DDC framework have been discovered in a slightly varying form. These dynamic capabilities include rapid prototyping, navigating innovation ecosystems, re-designing internal structures and improving digital maturity. The abovementioned dynamic capabilities have been redefined as rapid piloting, navigating innovation networks, digital ownership crafting and digital know-how & know-why training. Furthermore, digital business case development, digital alignment, digital stakeholder management, and digital roadmapping have been discovered as critical dynamic capabilities for Dutch SMEs included in the original DDC framework.

In addition, a new fourth digital dynamic capability cluster has been identified, titled digital safeguarding. This central capability cluster includes three sub-capabilities: digital milestone management, digital support and digital feedback management.

Moreover, none of the initially suggested DT outcomes by the DDC framework have been uncovered by the findings of this study. Nevertheless, this study has specified five central desired DT outcomes: improvements in cybersecurity, user-friendliness, efficiency, insights and differentiation.

Lastly, part of the central research question of this present study aimed to explore how DT determinants change over the pre-implementation, implementation and post-implementation phases of the DT process. However, after careful analysis of the research results, evidence supporting this is inconclusive. Therefore, no conclusion can be drawn on the effect of DT stages on the determinants. This implies that all determinants mentioned in the newly proposed DDC framework should be considered equally important for each stage of the transformation.

Based on the findings of this study, a re-design, tailored to the Dutch SME context, for the DDC framework by Warner and Wäger (2019) has been proposed. The re-design can be found below in Figure 5.

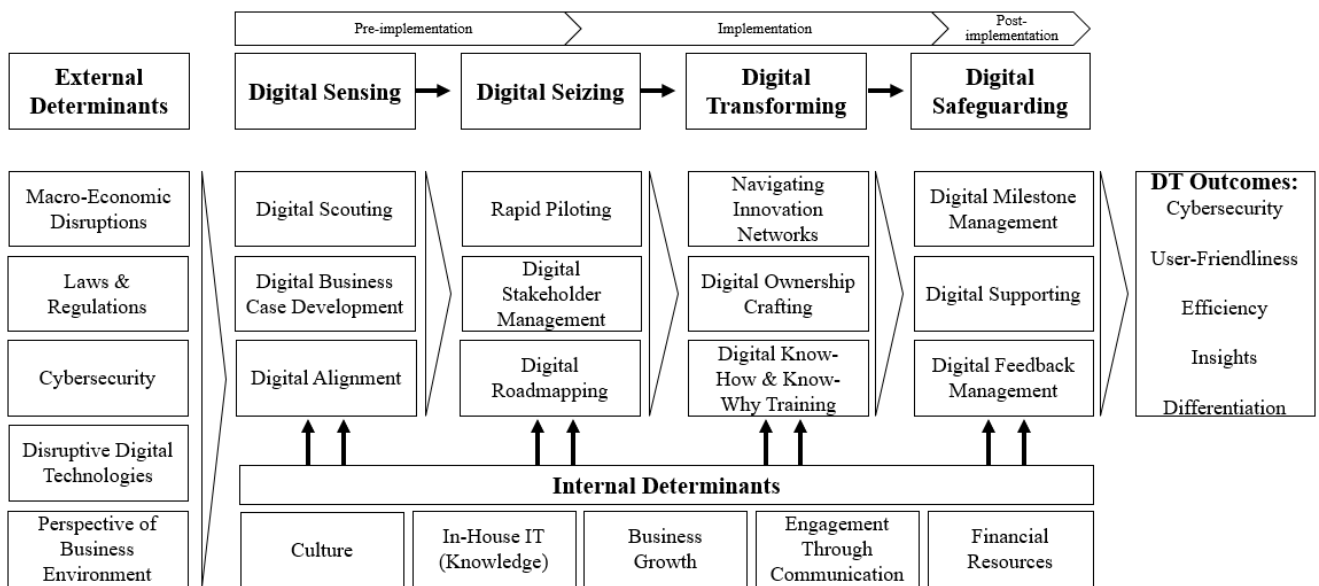


Figure 5. Digital dynamic capabilities for Dutch SMEs

5 Discussion

This study aimed to explore and identify the determinants of DT in a DDC context in its different stages in Dutch SMEs. More specifically, this study aimed to explore the impact of drivers and barriers of DT within Dutch SMEs and how these impacts vary across the pre-implementation, implementation, and post-implementation phases. The determinants of DT in Dutch SMEs were explored to enhance the insights into the challenges and opportunities SME executives face when embracing digital technologies. This study aimed to contribute to the existing literature in three ways. The study aspired to increase the understanding of DT in the SME context to address the current lack of understanding (Ghobakhloo et al., 2022). Secondly, this study aimed to clarify how the DT determinants changed over the DT phases. Thirdly, this research introduced a fourth capability to the DDC framework based on the change management literature.

A qualitative research method was adopted to address this study's aim. This research started with a critical review of the relevant literature on DT, SMEs and (digital) dynamic capabilities to gain a general understanding of the academic perspective of this topic. This formed the foundation for the semi-structured expert interviews used as the primary data source. The insights from nine expert interviews were validated through an expert panel with extensive experience and knowledge of the Dutch SME sector. These triangulated findings have been integrated to re-design the DDC framework introduced by Warner and Wäger (2019) to fit the Dutch SME context.

The first aspect of the re-designed DDC framework that will be discussed is the determinants of DT. This study discovered internal determinants, including culture, in-house IT (knowledge), business growth, engagement through communication and financial resources. In line with academic literature, financial resources (Ramilo & Embi, 2014) and in-house IT knowledge (Feliciano-Cestero et al., 2023) have been acknowledged as internal determinants of DT in SMEs, mainly hindering DT when lacking. A lack of in-house IT knowledge could impair a DT process, hindering SMEs from fully comprehending digital opportunities (Giotopoulos et al., 2017). Moreover, Eller et al. (2020) explained how the smallness and flexibility might make it easier for SMEs to create positive attitudes, which could grow to become another internal determinant discovered by this study, an innovative culture. Within SME culture, the role of management is accentuated by the interviewees as well as the existing literature, which indicates that leaders can catalyze DT (Vogelsang et al., 2018; Machado et al., 2021;

Matarazzo et al., 2021; Feliciano-Cestero et al., 2023). In line with this study's findings, a culture favourable to DT also includes a digitally oriented HR department. Literature has shown how an HR department can contribute to the success of DT through the way they can shape the organizational design (Vogelsang et al., 2019b; Warner & Wäger, 2019; Sousa-Zomer et al., 2020; Sigari et al., 2021). However, potentially the most crucial task of HR is to attract digital talent, which is often lacking (Vogelsang et al., 2019b; Shahi & Sinha, 2020; Rupeika-Apoga & Petrovska, 2022; Skare et al., 2023). Another newly gained insight regarding the culture of SMEs is that their approach to employees and customers is a core strength of their business strategy. Therefore, they can be hesitant to embrace digital technologies that might replace this personal approach with automated processes.

Moreover, academic literature and some interviewees have mentioned change fatigue in the context of continuous change. Contrary to this, several interviewees indicated they possess a culture where employees are energized by exploring DT opportunities. Additionally, the overall difference in size between SMEs and large organizations might enable engagement and communication. Engagement is essential to DT (Machado et al., 2021), and interviewees recognized this by describing engagement as often achieved through informal and ad-hoc ways. The importance of engagement and communication has been confirmed by existing DT literature, which reports that failing to convey a sense of urgency (Argawal et al., 2019) or the knowledge of benefits (Deepu & Ravi, 2021) can hinder DT. Lastly, the only newly found internal determinant that is not yet acknowledged by existing literature is business growth. This might be explained due to the overall focus on large organizations that are less likely to change their internal processes based on business growth, as they already have policies and IT systems in place that support them in this growth.

Next to the internal determinants, five external determinants of DT in Dutch SMEs have been discovered: macro-economic disruptions, laws & regulations, cybersecurity, disruptive digital technologies and the DT perspective of the business network. In line with the existing DDC framework (Warner & Wäger, 2019), the interviewees recognized disruptive digital technologies and their accelerating development as an external determinant.

Contradictory to the existing DDC framework, which claims that changing consumer needs trigger the adoption of DT, this present study has found that, if anything, the needs of SME customers are unchanging, which withholds SMEs from embracing

DT. Partially in line with the existing DDC framework is that digital competitors are the only group of actors in the business environment that have been revealed to be triggering DT, yet not in a disruptive manner. Additionally, the finding that governments, which create the laws and regulatory frameworks that SMEs have to operate within, play a role in DT are supported by existing literature (Cardinali et al., 2022; Matt et al., 2023; Skare et al., 2023).

Moreover, in line with the findings presented by this present research, several macro-economic disruptions, like the energy crisis and soaring inflation resulting from the war in Ukraine (Skare et al., 2023), have been discussed by previous literature. The expert panel explained how the increasing interest rate might also affect DT, as it makes it harder for SMEs to attract capital, which has been deemed as crucial by academics (Rupeika-Apoga & Petrovska, 2022; Skare et al., 2023). Furthermore, this study adds the structural labor shortage to this theme, as it has been mentioned to influence how organizations view DT when they cannot find the appropriate workforce necessary to embrace new digital technologies. Also, the COVID-19 pandemic and sustainability were mentioned as a past and future macro-economic disruptions that could impact DT. Finally, cybersecurity concerns are an external determinant of DT previously found by the existing body of research (Machado et al., 2021) but have not been identified as a significant theme in the literature review.

A central aim of this research was to identify the determinants relevant for SMEs and study how these determinants change over the DT's pre-implementation, implementation and post-implementation phases. As mentioned in the interviews, change has become a constant in the current dynamic market. DT is viewed as a continuous process by this study's interviewees and academics that begins (once more) before it has indeed ended. The fading boundary between the post-implementation of one transformation and the pre-implementation of the following transformation might explain why there is no noticeable distinction between the determinants in each phase. This phenomenon becomes visible in academic literature, as DT drivers and outcomes are often used interchangeably or confused (e.g. Ferrari et al., 2022). Perhaps, academics should speak of a continuous implementation instead of a pre-, during and post-implementation phase. Alternatively, it could be that the interrelationships of determinants, as determined by literature (Ramilo & Embi, 2014; Machado et al., 2021; Hanelt et al., 2021), creates a complexity that exceeds the research scope that a Master's dissertation can capture. All things considered, the evidence found by this present study

was too limited to draw any conclusion on how determinants could change over the different DT phases.

Moving on to the different capabilities required for DT in Dutch SMEs, this research has retrieved three sub-capabilities for each of the central sensing, seizing, transforming and newly presented safeguarding capability clusters. While there are some similarities between required capabilities and some determinants of DT, there is a notable difference. I interpret determinants of DT as a static factor or a snapshot of a specific moment. Capabilities, on the other hand, especially dynamic capabilities, are processes, resources or actions that develop over time. More academic research is needed to support or oppose the findings of this present study. Leaving more room for interpretation rather than empirically grounded theory.

Beginning with the first ‘digital sensing’ cluster from the DDC process model, the re-design proposed digital scouting, digital business case development and digital alignment. Consistent with the existing DDC framework, digital scouting has been confirmed to be relevant in the SME context. A noteworthy theme within the digital scouting sub-capability is digital networking. Networks allow SMEs to gather knowledge external to their organization by discussing digital trends with their peers or competitors, which matches earlier statements that stress the importance of networking capabilities (Favoretto et al., 2021). Furthermore, digital alignment was uncovered as a relevant scouting capability, which is coherent with literature that stresses the importance of a digital strategy in general (Argawal et al., 2019; Vogelsang et al., 2019b; Eller et al., 2020; Shahi & Sinha, 2020; Stentoft et al., 2021; Favoretto et al., 2021) and specifically in the context of alignment with business strategy (Machado et al., 2021).

In contrast to the current DDC framework and the DT literature, digital business case development has been mentioned in the interviews as a vital sensing capability. I would suspect that establishing whether or not a project provides a positive value is too simplistic or apparent for larger organizations, which could be why it is not recognized in other academic works. Nevertheless, since it was mentioned throughout most interviews, it can still be viewed as an essential capability in the specific context of this study.

Proceeding to the seizing capabilities, rapid piloting, digital stakeholder management and digital roadmapping have been identified as essential sub-capabilities. Partially following the DDC framework, rapid piloting has been detected in contrast to the suggested rapid prototyping. While they convey a similar notion of a testing phase, it became apparent that the creation of prototypes is not present in most SMEs, whereas

nearly all interviewed SMEs engage in a piloting phase. Dutch SMEs indicate that testing a digital technology allows them to resolve any teething problem and helps them understand the implementation and perceived value from the user's perspective. Additionally, in line with existing studies, stakeholders are crucial to the DT journey (Shahi & Sinha, 2020; Matt et al., 2023).

In contrast to the DDC framework, which states that digital scenario planning occurs in the sensing phase, this study has retrieved that Dutch SMEs start with creating a planning or roadmap only after they have successfully sensed a digital opportunity or challenge. Academic literature confirms that working towards a goal or having a vision is vital for DT (Shahi & Sinha, 2020). Therefore, digital roadmapping has been included as a relevant sub-capability within the seizing cluster.

Continuing to the third central digital transforming cluster, navigating innovation networks, digital ownership crafting and digital know-how and know-why training have been found as relevant sub-capabilities. While these three sub-capabilities resemble the three transforming sub-capabilities proposed by the original DDC framework, they are different. The most significant difference is that they are less complex or require a more simplistic skillset. The original DDC framework mentions navigating innovation ecosystems, but interviewees indicated that ecosystems are absent among Dutch SMEs; instead, networks are utilized for a specific purpose or challenge faced without any mutual reliance or complex interrelationship. Moreover, as mentioned above, both the DDC framework and other academic sources have mentioned that re-designing internal structures can benefit DT. Interviewees reveal a less disruptive solution; digital ownership crafting only re-designs the job design of a few or single employee(s) by making them responsible and accountable for DT projects. The last digital transforming sub-capability is digital know-how and know-why training. Conforming to extensive literature, specific skills are required for DT (Nguyen et al., 2015), which can be learned through training and knowledge sharing (Machado et al., 2021; Feliciano-Cestero et al., 2023). Following Kozanoglu and Abedin (2021), this sub-capability exceeds educating how digital technology should be used. It is just as relevant to teach the users why it should be used so they truly understand the relevance and urgency of the new ways of working, which could prevent them from falling into old habits.

Advancing to the fourth and last central capability cluster, the newly discovered digital safeguarding cluster. Three digital safeguarding capabilities have been identified, digital milestone management, digital supporting and digital feedback management.

Digital milestone management concerns the fragmentation of a large project into short and achievable goals. This guides the DT process, enabling the organization to generate quick and visible successes. Additionally, it is important to acknowledge and celebrate these successes, as this allows the employees to remain enthusiastic. Secondly, digital supporting helps DT processes in Dutch SMEs, as having quick access to an IT expert allows the organization to quickly respond to questions or problems that arise after the implementation. Lastly, digital feedback management regards collecting feedback, revising it, and ultimately following up on it. Following up on feedback has been described in the interviews as a crucial part of feedback management, as employees that do not feel heard are more likely to show resistance or stop providing the organization with (valuable) feedback. At the same time, it can drive DT if people see that their feedback and suggestions have been integrated into the solution.

The last factor that the DDC model discusses is the desired DT outcomes. This present study's suggested desired DT outcomes are improvements in cybersecurity, user-friendliness, efficiency, insights and differentiation. In contrast to the DDC framework, Dutch SMEs do not completely transform how they create their value in a revolutionary manner but seek to evolve their current business model more efficiently. Indicating the confusion between DT drivers and outcomes, several authors have mentioned process improvements in the context of a driver instead of an outcome (Herceg et al., 2020; Jones et al., 2021). Consistent with the findings of Cardinali et al. (2022), not only are efficiency improvements important, but the accuracy of the processes can also drive organizations. This is reflected in the desired improvements in insights reported by the interviewees, which can be enabled through a data-driven work approach. Ultimately, this could lead to cost reductions or improved processes. Enhanced insights may also contribute to understanding the potential value of DT when data allows the organization to measure the success of a technology.

Interviewees indicate that an improved process can also create value without reducing costs, coherent with the finding that workplace improvements are a significant driver (Jones et al., 2021). Moreover, DT can be used to differentiate the business model from competitors. An organization embracing DT can deliver enhanced value to clients or become more attractive to new talent keen to work with new digital technologies. Furthermore, the increasing awareness of cybersecurity. Interviewees noted that the chance of cyberattacks is increasing and recognize that they must protect themselves with improved security measures.

6 Conclusion, limitations and future research directions

DT has positioned itself as a pivotal cornerstone on strategic leadership agendas (Fitzgerald et al., 2014; Hess et al., 2016; Singh & Hess, 2017). Despite the growing body of research on the DT concept (Vial, 2019; Hanelt et al., 2021; Matt et al., 2022), academics have yet to understand how DT determinants affect SMEs (Ghobakhloo et al., 2022). Additionally, ambiguity still exists regarding the different phases DT goes through (North et al., 2020) and which capabilities are required for each phase (Zhu et al., 2021). Therefore, this present study has explored the determinants of DT, across its phases in Dutch SMEs, through the lens of DDCs.

To explore this, the current research has conducted a literature review and compared this to empirical evidence collected through interviews with nine Dutch executive-level SME managers. On top of this, an expert panel has been utilized to validate the findings. Based on these findings, a re-design of the DDC framework (Warner & Wäger, 2019) has been proposed.

The most significant limitation of this research is related to the qualitative research method used, namely expert interviews. While interviews allow for collecting rich and descriptive data, it does not necessarily implicate normative behaviour. Therefore, the findings rely on these experts' personal experiences and inherently subjective opinions, which may have been affected by personal biases or knowledge gaps. The current study tried to limit subjectivity by triangulating the expert insights with a literature review and an expert panel. Future research could empirically validate the newly proposed framework through quantitative research. Alternatively, future researchers could adopt a case study in which they follow multiple organizations over time through the different DT phases. This way, academics could objectively observe normative outcomes instead of relying on subjective reports.

Moreover, the sample that was used in this study has three main limitations. Firstly, due to the relatively small sample size, the generalizability of the findings may be limited. Secondly, the sample was collected using convenience sampling. All respondents were contacted through the network of Joanknecht, which mainly operates in the Brainport region surrounding the city of Eindhoven. Thirdly, all participating experts, both in the expert interviews and the expert panel, were males, reducing the diversity of the sample. Future researchers should aim to acquire a more extensive and randomly selected sample, preferably one that is more diverse.

Additionally, due to the limited timeframe for this study, only articles on the general concept of DT were included. This has resulted in the exclusion of papers on specific DT technologies, such as blockchain or machine learning. This may have caused the literature review to represent the available evidence on DT technologies only partially. Future research could conduct a literature review or meta-analysis that integrates all the fragmented studies on the general concept of DT and the specific DT technologies.

Furthermore, the results of the expert interviews have all been coded by one researcher, leaving room for a potential personal bias. Efforts have been made to mitigate this limitation by iterating through the coding process multiple times to check for inconsistencies or gaps. Moreover, the preliminary findings and codes were presented to an expert panel, who validated most of the findings. Future research could limit personal bias by going through the coding process with multiple researchers.

In a more general sense, future research could conduct a causal analysis of the determinants and outcomes of DT. This could be a relevant contribution as determinants and outcomes of DT are regularly used interchangeably (Stentoft et al., 2021; Plekhanov et al., 2022), which confuses what factor precedes the other. This makes it difficult to clearly distinguish what causes or hinders DT and the effects of DT. For example, IT skills could be a determinant of a successful DT process, but the development of IT skills could also result from a DT process. By clarifying the interrelationship between these concepts, empirical evidence could aid in ending the chicken or egg causality discussion in which several DT determinants and outcomes are currently. Therefore, in line with Morakanyane et al. (2017), this study would urge future researchers to refrain from defining desired outcomes as a DT driver. Additionally, by using a taxonomy like the one proposed by Vogelsang et al. (2019b), one can develop a profile of any determinant, which can contribute to an integrated research field by categorizing determinants in a standardized manner.

Concludingly, this research helped to advance the conversation and understanding of DT determinants in the context of (Dutch) SMEs by proposing a re-design of the popular DDC framework by Warner and Wäger (2019) tailored to the SME industry. Moreover, this study explored the relevance of DT determinants over the different DT phases, categorized into pre-implementation, implementation, and post-implementation. Additionally, this research has contributed to the academic literature by proposing a fourth ‘digital safeguarding’ capability cluster, which is focused on stabilizing and integrating the change process. Lastly, this study has practical value, as it can aid

Joanknecht in improving their advisory services and SME leaders in deepening their understanding of DT's driving and hindering factors.

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Appendices

Appendix 1: Interviewee information

An overview of the respondent's information can be found below. The table includes personal information as well as information about the organization of the interviewee. Note that all information has been anonymized to guarantee the integrity of the information and insights provided by the interviewees.

Interview number	Personal					Organizational			Research
	Age	Gender	Study background	Company role	Years of Experience	Sector	Number of Employees	Annual Turnover (Million, €)	Interview duration (Mins):
Interviewee 1	40	Male	Business informatics	Business & IT Manager	19	Finance	170	5	43
Interviewee 2	46	Male	Accountancy	CFO	17	Social Services	130	25	56
Interviewee 3	32	Male	Management sciences	CEO	12	Information Technology	85	12	30
Interviewee 4	41	Male	Leisure mgmt.	COO	17	Marketing & Advertising	20	1.8	47
Interviewee 5	33	Male	Accountancy	(Interim) CFO	14	Manufacturing	30	10	29
Interviewee 6	50	Male	Hospitality	COO	22	Marketing & Advertising	60	6	50
Interviewee 7	39	Male	Business economics	CFO	15	Construction	55	65	55
Interviewee 8	48	Male	Finance	CFO	25	Manufacturing	100	35	45
Interviewee 9	37	Male	Business economics	CFO	12	Construction	75	80	37
Average:	41	-	-	-	17	-	81	30	44

Appendix 2: Interview Guide

Research introduction:

- I am conducting a study on the different factors that impact the adoption of digital technologies among Dutch SMEs. My research discusses themes like digital transformation and digital dynamic capabilities. The central research question of this study is: “What are the key determinants that impact a digital transformation in its different phases in Dutch SMEs, from a digital dynamic capabilities perspective?”.

Defining the main concepts:

- Definition digital transformation: The use of new digital technologies to enable major business improvements.
- Definition digital dynamic capabilities: the capacity of an organization to purposefully create, extend, and modify its resource base (in the context of DT)
- Definition digital opportunities/challenges: Opportunities or challenges that arise from the development or adoption of digital technologies

Value of the insights:

- Your answers are valuable as they can provide insights in the adoption process of digital technologies in Dutch SMEs. The aim of this interview is to explore and determine the different factors that influence the adoption of digital technologies, and how these factors change over the different phases of DT.

Important to tell:

- For this interview, (if applicable) more than one answer is possible, if not desirable. There is not one correct or best answer. It is important to keep in mind that most questions will be asked from the perspective of the organization, and not the individual.

Research integrity:

- Ask participants for their consent to having the interview recorded solely for the purpose of this research. The data will be anonymized before analysis in a way that it is not possible to trace the outcomes back to the individual or organization. All stored data will be permanently deleted after successful completion of this study. The interview will take approximately 45 minutes.

Interview questions:

- Demographics
 - o Personal (Gender, Age, Study background, Year of working experience, Position in company)
 - o Organizational (Number of Employees, Approximation of Turnover, Sector)
- Interview questions:
 - o Digital transformation:
 - What digital initiatives has your organization gone through?
 - What digital initiatives is your organization planning on going through?
 - How do digital/IT trends & opportunities impact your organization?
 - o Digital transformation Barriers:
 - Which factors, within your organization’s control, are currently hindering your organization from exploiting digital opportunities? (internal barriers)
 - Which factors, outside your organization’s control, are currently hindering your organization from exploiting digital opportunities? (external barriers)
 - o Digital transformation Drivers:
 - Which factors, within your organization’s control, are currently enabling your organization to exploit digital opportunities? (internal drivers)
 - Which factors, outside your organization’s control, are currently enabling your organization to exploit digital opportunities? (external drivers)

- Digital dynamic capabilities:
 - Which capabilities have helped your organization to sense/scout for digital opportunities?
 - How does your organization gather information about relevant digital opportunities or problems, or analyze them?
 - How does your organization evaluate digital opportunities or problems?
 - How does your organization monitor and understand changes in the digital landscape?
 - How does your organization ensure that you are effectively interpreting relevant information about digital opportunities?
 - Which capabilities have helped your organization to seize digital opportunities?
 - What activities follow after your organization has identified a digital opportunity or problem?
 - Which strategies or processes does your organization employ to pursue digital opportunities?
 - What would need to change to make the best use of these digital opportunities?
 - Which capabilities have helped your organization to transform digital opportunities?
 - How does your organization approach the adoption of digital opportunities/technologies?
 - How does your organization manage the shifts and changes associated with the adoption of digital opportunities/technologies?
 - Which capabilities have helped your organization to secure digital opportunities?
 - How does your organization manage digital opportunities after they have been adopted?
 - How does your organization monitor digital opportunities after they have been adopted?
 - How does your organization ensure that digital opportunities are integrated in the existing organizational routine?
- Digital dynamic capabilities and determinants across different digital transformation stages/phases:
 - How would you categorize different stages/phases of the adoption of digital technologies/opportunities?
 - Which barriers/drivers are the most important in the pre-implementation phase?
 - Which barriers/drivers are the most important in the implementation phase?
 - Which barriers/drivers are the most important in the post-implementation phase?
 - Which barriers/drivers are important across all phases of a digital initiative?
- Is there any question that was unclearly formulated, or that was difficult to understand?
- Is there anything you would like to add, or something relevant this interview failed to touch upon?
- Are you interested in receiving the research findings from this study?

Appendix 3: Code summary (determinants)

The transcripts of the interviews will not be made available due to the sensitive and confidential information that is provided in the interviews. However, a visual representation of the interviewee answers and their corresponding codes (for the determinants of DT) are provided in the overview below.

	Interview 1	Interview 2	Interview 3	Interview 4	Interview 5	Interview 6	Interview 7	Interview 8	Interview 9
External determinants									
Pandemic	■					■			
Data availability		■						■	
Perspective of value chain	■		■	■	■	■	■	■	■
Disruptive technological developme	■			■	■	■	■	■	■
Cybersecurity	■	■				■	■		■
Laws and regulations	■	■	■	■	■	■			■
Labor shortage	■	■			■				
Internal Determinants									
Change fatigue	■	■		■			■	■	
Engagement and communication	■	■	■	■		■	■	■	■
Informal communication channe		■	■		■	■			■
Motivation to change	■	■	■	■	■	■	■	■	■
Knowledge to change		■	■	■			■	■	
Visible progress		■		■			■	■	
Culture	■		■	■	■	■	■	■	■
Top management support	■		■					■	
Fascination, wow, pride	■		■	■	■	■			
Digitally-oriented HR			■					■	■
In-house IT (Knowledge)	■	■		■	■	■	■	■	
Business growth		■	■	■		■	■		

Appendix 5: Expert panel information

An overview of the information of the participants in the expert panel can be found below.

Expert number	Age	Gender	Study background	Company role	Years of Experience
1	42	Male	Retail management	Medior Client Manager	22
2	47	Male	Business Administration	Partner, Team lead	21
3	33	Male	Accountancy	Business development manager	14
Average:	41	-	-	-	19

Appendix 6: Interview Quotes (determinants)

An overview of the interview quotes from the transcriptions used to support the ‘DT determinants’ findings (Chapter 4.1) can be found below. In this table, the quote itself, the interviewee number and the finding it supports are included. They are structured in the same manner as the results, so they are in order of the finding that the quote supports. The quotes in the overview are just a limited version of the total findings but are an indicative notion to support each finding. Lastly, it is important to note that all these quotes have been translated from Dutch to English.

In support of	Interview #	Quote
Finding 1	Interview 1	“As an organization, we want to be progressive, also in the case of technology.... Plus, it is in the DNA of our employees”
Finding 1a	Interview 3	“That is what you get when people are in a position longer than a year, then you lose your sharp edge to notice things. If you rotate with new people or tasks, you will get bigger ideas more quickly”
Finding 1b	Interview 3	“I think we should be wary of automation. We do not want to become a machine; our power lays in our personal approach”
Finding 1b	Interview 8	“It is just not in our DNA, that is the biggest delaying factor”
Finding 1a	Interview 1	“The partners stimulate us to embrace and use the newest technologies”
Finding 1b	Interview 8	“DT comes from the upper layer, or me. But if I don’t feel like it (adopting new technologies), then no one will say anything about it”
Finding 1a	Interview 4	“It is a sort of ‘wow effect’.... That everyone thinks, we are crazy if we do not do this”
Finding 1a	Interview 8	“Our HR-policy should be more focused on a digital-savvy way of thinking. Not for everyone, but a small team would already help”
Finding 1b	Interview 2	“We chose for a 2.0 of our current system, what we didn’t want initially, but otherwise we would have lost the people...At that time, because there were so many changes, if we did any more, then it would have been too much.”
Finding 2a	Interview 1	“Having in-house IT (personnel) allows you to quickly provide support. I believe that is really important”
Finding 2b	Interview 2	“Our in-house IT knowledge is very limited, so we have to rely on others”
Finding 2a	Interview 7	“If we linger in our simplistic ERP system, then we have to make very large steps in the future. We also do this to prepare for what is still coming, which is still huge”
Finding 3a	Interview 2	“We grew rapidly, which meant that our needs changed. Digitalization also came into play every time during that growth and professionalization”

Finding 3b	Interview 6	"The more people you have, the more you have to think about whether or not you should do it (DT), with that amount of people"
Finding 4	Interview 2	"It is very simple, but involving employees in new innovations, explain them why."
Finding 4	Interview 3	"Communication is the absolute number 1. Proper communication and explanation will allow you to convince people in a positive way"
Finding 4a	Interview 4	"A driver is seeing the progress; it really does something if you progress on a short term"
Finding 4b	Interview 7	"We have been busy for 2 years while we initially planned to a maximum of one year. It has been a huge disappointment to everyone, and it has been a real headache at times"
Finding 4b	Interview 4	"Not having a clear goal is an obvious barrier, or not having a common goal. You should not be pursuing a different goal than I am"
Finding 4a	Interview 4	"Sharing knowledge with each other is also a driver"
Finding 4b	Interview 7	"Everyone would have some IT capabilities in an ideal scenario. Then you would say, just send them on a training course, which we did. But someone who is all thumbs cannot be learned to build a building, that is a major inhibitor"
Finding 4a	Interview 1	"If there is no clear 'what's in it for me?', or how am I going to benefit, then you notice that people do not adopt. If people see what the purpose is, then it can stimulate them to adopt more quickly. If they truly see, this is going to help me."
Finding 4b	Interview 2	"Change is always hard, and people tend to slip back into old habits"
Finding 4b	Interview 5	"You notice that they feel no urgency in the other departments to look at the data on a different way"
Finding 4b	Interview 7	"We hugely underestimated the amount of time that had to put in ourselves... If we had a dip in turnover, then the business was the priority, and the transformation was postponed for a month or two"
Finding 4a	Interview 1	"If people see that it will make their work more pleasant or faster, then it can cause an acceleration"
Finding 4a	Interview 3	"We work with 15 people internally, so the communication lines are short, which is a great advantage"
Finding 5	Interview 6	"It always comes down to money, you know. You can't always expect immediate results, of course"
Finding 5a	Interview 9	"We have to be selective in what we choose, as we are not a [big organization] with an unlimited budget"
Finding 6	Interview 2	"We will try to find someone and educate them ourselves, because the circle to find someone is not big"
Finding 6a	Interview 1	"Additionally, considering the labor market, if you show that you are a progressive organization, then people want to come for you. That is also an incentive to do it (DT)"
Finding 6a	Interview 8	"We could adopt robotization in our other factory. We have 70 employees now, if we invest X million, productivity will increase enormously. Then we could go from 70 to 20 (employees), which could be a great business case"

Finding 6a	Interview 6	“Especially in the time of COVID-19, when we could not go out on the street, is when we utilized it (social media) a lot. Later, we thought, wait a minute, we can keep using this. Now we use it everywhere, since it has a wide reach”
Finding 6b	Interview 5	“They are working to further robotization, only it is very difficult to find people for that..... So that really withholds us from further automation”.
Finding 7a	Interview 9	“I do not have to explain that the administrative load will increase due to regulations. That does not mean that our department has to grow. We could also explore how we could work smarter..... Automation or AI is definitely the next step.”
Finding 7b	Interview 4	“The first thing (barrier) I am thinking of is laws and regulation, AVG, GDPR, cookie laws.
Finding 8a	Interview 7	“Personally, I believe a cyber insurance policy is more important than our home (/inventory) insurance. The chances that our building burns down is smaller than the chance that someone breaks in digitally. Right now, we are rejected from a cyber insurance because the level of our IT is insufficient, so we are working on it”
Finding 8b	Interview 9	“Cybersecurity, you can want a lot of things, but you always have to consider safety. Especially because you work with confidential information, so that could be a restraint”
Finding 9	Interview 1	“You see that the market is driven by organizations like Microsoft, Google and Apple. MS Teams had not succeeded if Microsoft hadn’t been here..... Large organization often determine the direction organization are heading”
Finding 9a	Interview 5	“The systems that we use have to be compatible with each other. That is an important requirement that is often taken for granted”
Finding 9a	Interview 2	“At the moment, data is almost the new gold. We collect and receive all that data. We have all the information”
Finding 9a	Interview 8	“The data that we receive are all related to the strategic plan and operational KPI's. If you properly present the data that flows out to the management, using a BI tool. Then you are truly improving or executing the operational goals, that, in turn, lead to a broader strategic goal”
Finding 9b	Interview 5	“The organization cannot keep up with the speed (of technological developments) in the current market”
Finding 10b	Interview 8	“It is the whole value chain, if it is driven by your clients, then you have to adapt to their needs. We will never be the first to do this. I know other organizations who perform well, but I don’t see it (DT) happening there either.
Finding 10a	Interview 6	“You have to move with the market otherwise you are done in a few years. Then you will be that advertising agency that only designs posters for bus stops”
Finding 6	Expert panel	“Increasing interest rates make the access to external resources more difficult”
N.a.	Expert panel	“You would expect that within a few years, sustainability will become another trend”

Finding 11a	Interview 5	"The systems that we use have to be compatible with each other. That is an important requirement that is often taken for granted"
Finding 11a	Interview 8	"DT comes from the upper layer, or me. But if I don't feel like it (adopting new technologies), then no one will say anything about it"
Finding 11a	Interview 1	"The pre-implementation does not include a lot of people, so it is mostly a financial aspect.... And time, it might cost too much time to implement, or the return is too low"
Finding 11b	Interview 1	"Then, the bottleneck is: Why would I use this?"
Finding 11b	Interview 3	"I think the internal usage. We do test in a small group, and that test group is really important in how they experience it"
Finding 11b	Interview 8	"..The point of view of the user, in a way that you take the user, that eventually has to work with it, into account and engaged in the entire implementation"
Finding 11c	Interview 1	"A barrier can be if you do not give enough attention to the people after the implementation, which results in it not being used properly, or not being used at all"
Finding 11c	Interview 4	"A driver is celebrating the success and taking a moment to appreciate the success"
Finding 11c	Interview 4	"Every project in the post-implementation has a direct impact on the pre-implementation"
Finding 11	Interview 3	"I do not believe that there is something that becomes less important"
Finding 11	Interview 7	"These drivers are applicable to every phase"

Appendix 7: Interview Quotes (Digital dynamic capabilities)

An overview of the interview quotes from the transcriptions used to support the ‘digital dynamic capability’ findings (Chapter 4.2) can be found below. In this table, the quote itself, the interviewee number and the finding it supports are included. They are structured in the same manner as the results, so they are in order of the finding that the quote supports. The quotes in the overview are just a limited version of the total findings but are an indicative notion to support each finding. Lastly, it is important to note that all these quotes have been translated from Dutch to English.

In support of	Interview #	Quote
Finding 12	Interview 4	“That happens very naturally, there is no process behind it. We share everything throughout the office”
Finding 12	Interview 9	“If someone comes to me with something that they have seen that we will just experiment with it... At the front end, it is about evaluating. What possibilities are there? Which parties offer this? Which one fits best with our company?”
Finding 12a	Interview 1	“We will approach people from outside (the organization) to tell us more about it”
Finding 12a	Interview 3	“Multiple times a year, I have conversations with competitors, also with organizations that do something completely different, just to look at which improvements or innovations they are implementing. Even if we implement it in a totally different way, it can be a trigger to investigate it”
Finding 12a	Interview 7	“Information mainly comes in through specialists or ICT partners. We are not specialists, so that is where we mainly rely on. We do not scour the internet for opportunities, that is not our business.”
Finding 12a	Interview 4	“If it is one factor, then it is more in the lines of knowledge sharing. We do share, but not enough... You can inspire each other, on a working level, there is also ‘knowledge café’, but people often stay in their own tunnel.
Finding 12a	Interview 6	“We still share a lot through the people. Not via email, of which the first 20 do not read it, the second 20 read it but think ‘never mind’, and only the last 20 read it. That is the danger from automation, it is better to explain and confront people with it”
Finding 12a	Interview 4	“If you speak each other’s language, it is easier to understand each other and it allows you to detect opportunities faster”
Finding 12a	Interview 3	“That is what you get when people are in a position longer than a year, then you lose your sharp edge to notice things. If you rotate with new people or tasks, you will get bigger ideas more quickly”
Finding 12b	Interview 1	“In the preliminary phase you investigate how much time it will cost, what the return will be? Do we need to do this?”
Finding 12b	Interview 4	“If we have some projects, so that it can be profitable, then we will just do it. We are not going to make a whole science out of it, sometimes you just have to do it and see if it works. You will

		always learn something from it.... Such a business case is a main driver”
Finding 12b	Interview 8	“You make a business case in every step that you make. You invest this amount, what is the estimated return, and what will the profit be?... ”
Finding 12b	Interview 8	“We do not use an investment analysis with a cost of capital, and we only do it if the net present value is bigger than zero. It is more out of convenience, if it's useful, then we go for it, throw money at it, execute the plan, that is it. It is much more pragmatic. In the textbooks it makes perfect sense... It is logical to review and learn from it and move forward. But our processes do not work that rationally”
Finding 12c	Interview 1	“Now, it is also looked at from a strategic perspective. The question is if the link between innovation and strategy helps, but attention is definitely given to it... Now, if we see something, we look if it fits within the strategic framework. Then you can plot it within the strategy, so that it does not come as a surprise to people”
Finding 12c	Interview 8	“It is not just a matter of investing an X amount in a solution and figuring it out later. It needs to be part of a larger plan”
Finding 12c	Interview 8	“What I am currently working on is the IT strategy for the next 5 years. We will then work backwards to determine which steps we need to take. This allows us to make informed decisions that are appropriate for our organization.
Finding 13a	Interview 6	“Establish clear frameworks, often in the form of timelines”
Finding 13a	Interview 1	“If it (the technology) is a success, then a implementation planning will be made on how we are going to proceed”
Finding 13a	Interview 7	“A software provider cannot do that for us; we have to provide it ourselves. It is highly underestimated the time we need to invest in setting up the entire libraries. If we are experiencing a downturn in revenue... It can be put on hold for a month or two, which has been a significant barrier”
Finding 13a	Interview 8	“You have a timetable, purely for implementation”
Finding 13b	Interview 7	“We have had multiple sessions, including with the suppliers, where we involved various individuals, even project leaders, to collectively take ownership of the process. It is not simply handing it over at the end and wishing everyone good luck but ensuring that everyone is a part of it. This is an important aspect, especially when it comes to engagement. It feels entirely different when you have had the opportunity to share your opinions, and seeing the adjustments based on your advice”
Finding 13b	Interview 2	“Then it is discussed with stakeholders within the organization who are involved in the process. We recently became more professional in this regard. When we truly want to proceed with something, a project team is established, and a stakeholder analysis is conducted to identify those within and outside the organization who will be impacted by the change. This ensures that all relevant parties are informed when it comes to the implementation... This approach helps us recognize who the stakeholders are, and their opinions might be, as well as identifying roles where they can contribute”

Finding 13c	Interview 1	“Then we make sure that people from the organization are invited, so that you can pilot it with a reasonable cross-section of the organization”
Finding 13c	Interview 3	“I am in favor of testing it in a smaller group first. This way, most of the teething problems can be resolved before implementing it to everyone.... It allows you to anticipate the questions that will arise and respond to them more effectively. It leaves a strong impression when you can answer all the questions immediately. You do not want to have to say ‘we will get back to you’ for every question that arises. That would give the impression that it has not been thought out”
Finding 14a	Interview 1	“Since last year, we actually have an innovation team and an innovation manager, someone who is responsible for it. If there is no one accountable, you can notice that it does not get done due to the daily pressures people experience. I am not sure it works, but if you do not try, it definitely will not work”
Finding 14a	Interview 9	“We often have one or two people who are responsible”
Finding 14a	Interview 2	“We now have someone dedicated to handling these projects, and its their area of expertise. Previously, we used to handle it alongside other responsibilities and we can already see that it is partially related to capacity.... We have opted for a project leader, and we can see that it is making a difference”
Finding 14b	Interview 7	“In our planning, we included training programs to ensure that people can truly learn. It is not just a one-day affair; it involves dedicated training programs lasting two weeks, during which someone sits alongside them.... This approach ensures that they effectively embrace the new practices”
Finding 14b	Interview 8	“Make sure to include a training program so that people can learn how to work with it effectively”
Finding 14b	Interview 9	“Explain the reasons behind why you do things, bring people along, and when the time comes, we can roll it out. However, for adoption, it is always crucial to know why we are doing these things and does everyone understand the importance?”
Finding 14c	Interview 2	“ASML has offered to provide personnel and allocate budget to facilitate that”
Finding 14c	Interview 5	“Especially in terms of external support, as they do not have everything in-house, so that support during the implementation phase is crucial and often outsourced”
Finding 14c	Interview 7	“It has been proven through experience that having the IT vendor handle the implementation themselves does not work smoothly. It is like marking your own homework. Therefore, we actually prefer to have an independent intermediary who can assess it from the organization’s perspective and evaluate it in our best interest”
Finding 14c	Interview 6	“They can also come from external sources; it does not always have to be internal.... However, there are times when you feel that it could be done better, and having an in-house team would provide us with closer involvement and a better understanding of our specific requirements”
Finding 15a	Interview 1	“Project management is also really important, trying to make agreements
Finding 16a	Interview 3	“They always work in sprints of 4 weeks”

Finding 16a	Interview 4	"You see, what we try to do is adopt a lean approach in which we identify a problem. Then we conduct an analysis of what the real problem is. What are the solutions that can help with that? Then we implement it... When we talk about implementation, we are increasingly focusing on doing everything in sprints by applying scrum or kanban , and making real progress. Because then you see small, short iterative cycles in which every two weeks or every week or every month, depending on the size and tasks, you see something being added"
Finding 16b	Interview 1	"In addition, we have set it up in such a way that we have people available who can be directly approached if they have any questions, so that we can provide quick assistance when there are inquiries. This is often observed when you have implemented something, you also need to properly structure a process, and that is often achieved by designating the people who have run the pilot as superiors at the forefront. They can also guide the people at the backend"
Finding 16b	Interview 7	"Actually, the developer of the dashboard did that. He spent a few days sitting with each user and explaining how everything works. In principle, it is fairly simple once you know it. But you have to ensure that the adoption is satisfactory"
Finding 16b	Interview 9	"Often, when we make such changes, we also ensure that an IT-specialist is available at that time to address any questions. You always see, no matter what happens, there are always questions. They need to be resolved. People should not be hindered in their work process; they should be able to continue smoothly"
Finding 16c	Interview 1	"And if it is not being used, then you ask people why they are not using it. Do they not understand it? Do they not find it pleasant? This is done to remove that barrier. So, I think the focus should be more on monitoring and seeing if people are using it. Or by listening in informal conversations 'I do it this way, but why do I have to do it that way?'. That is more on the softer side, the human side of measurement... Not just gathering feedback, but also following up on it. I think that is very important in such a change process"
Finding 16c	Interview 3	"If you actually take actions based on the survey results, you will see that it generates a higher response rate. If you rarely do anything, I have had many surveys at Company X and at some point you start thinking, 'I have never seen any feedback, why should i bother doing it?'. But here, if you see that improvements are being made, that we are stopping something or continuing with it, or changing it, then people will definitely fill it out. If you first communicate what you are going to do and then actually follow through, then asking for feedback on new software or tools becomes meaningful, and after 3 or 6 months, you can truly let it go if the usage is good. Afterwards it becomes occasional monitoring or measuring to see how much it is actually being used"
Finding 16c	Interview 8	"You might think that everything must be fine as long as people do not complain. But then, after a year, you realize that is not being used correctly"
Finding 16c	Interview 2	"I think it has to do with the adoption phase. If you that well, that is one aspect. It is important to actively listen to what is happening within the organization when implementing a new development. Surveys can be used, but they often yield desired

		answers. It is often much better to stay in close contact with employees and have informal discussions. That way, you will truly hear what can be improved, and whether people are frustrated with it or not”
Finding 16c	Interview 5	“Especially through informal means, by asking, ‘Why are you not using it?’. Because it stands out when someone is not using it, while it may not be noticeable if everyone is using it. But when they hear complaints about someone not using it, they inquire about the reasons. They kindly request that they start using it, but they also ask what the barrier is for not using it”
Finding 16c	Interview 9	“You often hear about feedback during our application meetings, but we do not ask everyone, ‘Did it go well?’. We do not conduct a survey for that. We have short lines of communication. Even though we have 80 employees, we all interact with each other. There is no significant hierarchy, so if something is not right, I usually hear about it directly”

Appendix 8: Interview Quotes (Desired outcomes)

An overview of the interview quotes from the transcriptions used to support the ‘desired outcome’ findings (Chapter 4.3) can be found below. In this table, the quote itself, the interviewee number and the finding it supports are included. The quotes in the overview are just a limited version of the total findings but are an indicative notion to support each finding. Lastly, it is important to note that all these quotes have been translated from Dutch to English.

In support of	Interview #	Quote
Finding 19	Interview 6	“You should be aware that everything needs to be increasingly safer, as it also becomes increasingly dangerous... Privacy no longer exists unless you don't participate in anything. That's also technology”
Finding 19	Interview 9	“It should be safe, but above all, it should provide user-friendliness”
Finding 19	Interview 2	“This makes it more user-friendly, and the advantage is that it is done through an SSO (Single Sign-On) route, which is also safer than doing it through Google. This way, it is safer, easier, and you ensure that people always take the route you want, using a trick.
Finding 19	Interview 4	“The main goal is to create more time to be even more creative in our profession. Ultimately, the ultimate goal is to deliver higher quality. If we can do that in a shorter amount of time, then we can create more time to further improve that quality. Because there is one thing that we have noticed in the realm of marketing and communication, and that is that a fast time to market is super essential. So, the faster we can launch something to learn from it, improve it, and iterate each time.
Finding 19	Interview 8	“That will be a significant advantage, and if you can also produce it efficiently, you will have long-term benefits as well. The adoption of our products by customers has a lead time of at least two to three years. So, once you have developed something and it is taken seriously by our customers, we can truly benefit from it in the long run. Right now, it's about production efficiency, but in the future, it will extend to R&D and the entire supply chain”
Finding 19	Interview 6	“Furthermore, there's also an administrative aspect where you can have real-time insights into the state of your business every minute. How do we achieve that? In the past, everything was on paper and had to be calculated and counted manually. Now, if everyone enters their work and information accurately, I can see at the end of the day exactly what we have accomplished today and how we are performing. I can also assess our future standing for the next week”
Finding 19	Interview 8	“So that we can also analyze certain trends. We can also conduct retrospective analysis if something goes wrong to pinpoint the exact source of the issue. Therefore, we have complete traceability”

Finding 19	Interview 9	“Plus, the chance of errors keeps getting smaller, so we are improving in that regard”
Finding 19	Interview 9	“You ensure that you remain distinctive. If we all do the same as other construction companies, what sets us apart? ...We always want to be at the forefront to maintain our distinctiveness and continue offering something extra to our customers. And yes, ICT is definitely an example of that”
Finding 19	Interview 1	“Why? Because if we can it internally, we might be able to incorporate it in our service or advise for clients”
Finding 19	Interview 9	“Being more attractive for new personell and clients”

Appendix 9: Expert panel Quotes

An overview of the interview quotes from the transcriptions used to support the expert panel findings (Chapter 4.4) can be found below. In this table, the quote itself, the interviewee number and the finding it supports are included. The quotes in the overview are just a limited version of the total findings but are an indicative notion to support each finding. Lastly, it is important to note that all these quotes have been translated from Dutch to English.

Validates:	Expert #:	Quote:
Digital alignment	Expert 3	"Shouldn't a digital ambition, strategy or vision be a digital sensing capability?"
Need for insights	Expert 3	"One that I would expect here (Internal determinant), is the need for insights. That is often mentioned, and I do not see it here"
Need for insights	Expert 2	"I think that [Expert 3] raises a great point, insights are really important, especially regarding data. That often involves technology"
New	Expert 3	"I think that if you conduct the same study in a few years, sustainability would be a prominent external determinant. Maybe if you included really large organizations, it would already be there"
Digital Safeguarding	Expert 3	"You could also recognize the ADKAR model, in this framework"
New	Expert 2	"Has external capital not been mentioned as an external determinant? Due to the rising interest rates and shrinking subsidies"

Appendix 10: Data management plan

The first step in the data management lifecycle begins with compiling data. This involves conducting a literature review as secondary data, and primary data will be collected through interviews. The research will obtain the necessary research permits, like the interviewee's consent, by asking the interviewees. The next step in the data lifecycle is the storage of the data. The data will be stored on a personal computer, to which only the researcher has access. Besides this, a safe OneDrive map has been created by Joanknecht, to ensure that a back-up can be maintained on the cloud, in case something would happen to the researcher's personal computer. On the personal computer, one map will be dedicated to this research, and documents will be named according to their contents. After the research is complete and the retention period is over, the data will be deleted to protect the privacy of the interviewees.

Appendix 11: The use of Artificial Intelligence (AI)

Artificial Intelligence, mainly in the form of ChatGPT by OpenAI, has been used throughout this dissertation, but not in a generative manner. AI has been used in a supportive manner, which includes reformulating sentences written by me, suggesting words or synonyms to apply in a specific context, or to generate background information on a certain topic or concept. The use of AI supported this dissertation mostly throughout the writing process of the introduction and literature review, yet it also contributed to the other chapters. AI has not been utilized for direct copying of generated text, nor has it been used for the validation of arguments, as the correct use of academic and up-to-date sources is still a main limitation of ChatGPT. ChatGPT has been used to aid in the translation of the transcriptions, where pieces of text have been purposefully copied, as this can contribute to a more objective translation. Besides ChatGPT, ElicitAI has been used for the literature review. This is an AI algorithm that can find studies related to a certain prompt. Therefore, this AI tool has only been used for the discovery of a handful of studies. A reference table on the use of AI can be found below, note that unless stated otherwise, ChatGPT is the utilized AI tool:

Chapter	AI used for
Introduction	Generating research question ideas, (re)formulation aid, suggesting synonyms/antonyms/linking words/collocations
Literature review	(re)formulation aid, suggesting synonyms/antonyms/linking words/collocations & ElicitAI for searching related papers
Methodology	(re)formulation aid, suggesting synonyms/antonyms/linking words/collocations, suggesting pros and cons of different research methods
Results	Translation of interview quotes, (re)formulation aid, suggesting synonyms/antonyms/linking words/collocations
Discussion	suggesting synonyms/antonyms/linking words/collocations
Conclusion	suggesting synonyms/antonyms/linking words/collocations

Appendix 12: Overview of determinants mentioned in current literature

Determinants	Focus on SME?	Research context	Research objective	Research method	Authors
Barriers 1. Lack of sense of urgency 2. Lack of industry-specific guidelines 3. High implementation/running costs 4. Lack of top-management support 5. Lack of digital skills/talent 6. Lack of business and IT alignment 7. Inappropriate organizational structure 8. Lack of strategic orientation 9. Inability to keep pace with digital business dynamism 10. Rigid business processes 11. Fear of losing confidential information 12. Risk of taking initiative	No	Digital supply chain sector	Identify DT implementation barriers	Mixed methods (expert panel + interpretative structural modelling)	Argawal et al. (2019)
Barriers 1. Change averse culture (internal) 2. Organizational processes (internal) 3. Level of investments (internal) 4. Customer's aversion to change (external) 5. Fear of dependence on technological provider/partner (external) 6. Lack of integration of activities within network (external)	Yes	Italian accountancy sector	Examine digitalization barriers, drivers & tensions	Qualitative (19 interviews)	Cardinali et al. (2022)
Drivers 1. Pursuit of efficiency & accuracy (internal) 2. Need to develop new skills and competencies (internal) 3. Changing regulations (external) 4. Changing customer needs (external) 5. Interaction and benchmarking with others in network (external)					

<p>Barriers</p> <ol style="list-style-type: none"> 1. Poor data strategy and readiness 2. Lack of standardization practices for change 3. Competence and culture gaps 4. Ad-hoc problem solving 	No	Steel manufacturing sector	Understand how process industry firms develop and implement innovations	Qualitative (2 case studies)	Chirumalla (2021)
<p>Drivers</p> <ol style="list-style-type: none"> 1. Infrastructure and methodological definition 2. Prepare for predictive and analytical readiness 3. Proactive management practices 4. Planning a digital matureness for each function and department 					
<p>Barriers</p> <ol style="list-style-type: none"> 1. Complexity of systems and underlying processes 2. Lack of resources (skills resources) 3. Technology adoption 4. Resistance to change 5. Data protection (ranked in order of importance) 	No	(Large & digitally mature) Logistic service providers	Discover barriers and identify leading practices for DT success	Qualitative (Case study & interviews)	Cichosz et al. (2020)
<p>Drivers</p> <ol style="list-style-type: none"> 1. Leadership 2. Supportive organizational culture 3. Employee and partner engagement 4. Strategic business & IT Alignment 5. Process standardization and data integration 6. Employee training and skills development 7. Agile transformation management 8. Leveraging internal and external (technological) knowledge (ranked in order of importance) 					

Barriers 1. Causal Barriers (Lack of knowledge on benefits, Lack of top management commitment, Lack of financial resources, Lack of business and IT alignment, Poor organizational culture, non-encouragement of R&D, Lack of employee training) 2. Effect barriers (Lack of education and technical know-how, Information security threats, Employee reluctance to change, Mistrust among supply chain partners, Lack of commitment from supply chain partners to share information, Lack of framework and performance metrics for supply chain, Lack of long-term perspective in decision-making, Limitations in IT infrastructure and systems)	No	Electronic supply chain sector	Analyze barriers to supply chain digitalization	Mixed methods (4 interviews + analysis)	Deepu & Ravi (2021)
Barriers 8 categories and 50+ sub-categories	No	German banking sector	Identify DT barriers	Qualitative (32 interviews)	Diener & Špaček (2021)
Drivers 1. IT resources 2. Employee skills 3. Digital Strategy 4. Organizational factors (Flexible culture, Firm owner commitment,	Yes	Austrian organizations	Investigates impact of SME resources on digitalization	Quantitative (193 SME's)	Eller et al. (2020)
Barriers 1. Human factors 2. IT and data security risks	No	-	Identify routines of dynamic capabilities for DT	Qualitative (Focus groups & interviews)	Ellström et al. (2021)
Barriers 1. Organizational commitment (absence of DT-oriented strategy, Lack of leadership commitment, Lack of cultural alignment to DT values) 2. Value Creation ((Business processes (Increasing complexity in product/service development, technological process integration, technological integration across entire supply chain, changes in employee tasks and jobs, adverse digitalization effects), Resources and capabilities (Lack of selection/integration capabilities, lack of intelligence and connectivity capabilities, lack of analytical capabilities, lack of	No	Manufacturing sector	Identify DT challenges	Literature review	Favoretto et al. (2021)

<p>managerial and strategic capabilities), Partnerships (lack of collaborative perspective, lack of technical supply chain integration DUPLICATE, lack of networking capabilities))</p> <p>3. Value proposition (Identify/achieve perceived customer value)</p> <p>4. Value delivery (business processes (adapting customer relationship processes, lack of new sales approach)</p> <p>5. Resources and capabilities (Limited customer-based knowledge DUPLICATE, lack of relational capabilities)</p> <p>6. Partnerships (lack of co-creation with customer)</p> <p>7. Value capture (Lack of funds, Development of new sources of revenue, Difficulty in assessing financial return, lack of financial risk management)</p> <p>8. IT infrastructure and data security (Shortcoming in IT infrastructure and scalability, lack of architecture standards, lack of data security)</p>					
Drivers	No	-	Reviews factors influencing DT and internationalization	Literature review	Feliciano-Cestero et al. (2023)
<p>1. Training and knowledge exchange</p> <p>2. Top management support</p> <p>3. Leadership</p> <p>4. Servitization</p>					
Drivers		European agricultural/rural sector	Identify drivers, barriers and impacts of digitalization	Qualitative (30 interviews)	Ferrari et al. (2022)
<p>1. Economic (cost reduction)</p> <p>2. Technological (proven reliability/efficiency/simplicity)</p> <p>3. Regulatory (better monitoring required)</p>					
Drivers	No	-	Clarify the DT literature	Literature review	Hanelt et al. (2021)
<p>1. Legal and infrastructural conditions</p> <p>2. Technological landscape</p> <p>3. Increased data availability</p> <p>4. Leadership skills (DT awareness, DT acceleration, DT harmonization)</p>					

Barriers	No	Serbian manufacturing sector	Explore industry 4.0 implementation barriers and drivers	Quantitative (122 surveys)	Herceg et al. (2020)
1. Human resources (lack of skills and competences)					
2. Lack of financial resources					
Drivers					
1. Efficiency factors					
2. Customer satisfaction					
Barriers	No	Different industries & countries	Understand the challenges and opportunities of social and digital business	Quantitative (4300 respondents)	Kane et al. (2018)
1. Competency traps					
2. Lack of experimentation and iteration					
3. Dealing with ambiguity and constant change					
4. Buying and implementing the right technology					
5. Lack of organizational support to develop employee skills					
Drivers					
1. Development of digital leaders					
2. Push decision down (distributed leadership)					
3. Growth Mindset					
4. Being likely to experiment and iterate (culture?)					
Drivers	No	-	Explore the role of digital literacy in DT.	Qualitative (Focus group of 11 experts)	Kozanoglu & Abedin (2021)
1. Digital literate employees					

Barriers	Yes	Brazilian supply chain sector	Barriers and enablers of Industry 4.0 integration	Mixed method (25 interviews, 2 focus groups of 6 experts)	Machado et al. (2021)
1. Lack of technical expertise					
2. Cybersecurity issues					
3. resistance to change (in society)					
4. lack of investments in R&D					
5. cost of improvement					
6. lack of regulatory support or poor legislation					
7. lack of commitment from top management					
8. alternative resources and energy needs					
Drivers					
1. Organizational (Top management commitment & Strategic alignment)					
2. People (Employee empowerment, Knowledge sharing & Effective communication)					
3. Internal innovation process					
4. Technological (Data-centered solutions & Consistent data flow)					
5. Sustainability (Interdisciplinary and holistic integration & Life cycle thinking and circular processes)					
6. Customer and supplier integration					
7. Governmental and institutional pressures					
8. Valuing R&D and research centers					
Barriers	No	Swiss infrastructure sector	Identify DT barriers	Qualitative (2 rounds of: 9 interviews & 23 interviews)	Manny et al. (2021)
1. Individual barriers (lack of vision)					
2. Organizational (Lack of resources, Lack of digitalization culture)					
3. Institutional (Administrative fragmentation)					

Drivers 1. Diversified management team 2. Top management curiosity to DT 3. Technology developments 4. 'Young' Organizational culture	Yes	Italian Family organizations	Examine DT and customer value creation through a capability perspective	Qualitative (6 Case studies)	Matarazo et al. (2021)
Barriers 1. Organizational barriers (skeptical attitudes, cultural rigidity, lack of commitment/motivation, implementation & opportunity costs) 2. Market barriers (unreadiness of customers & suppliers, uncertainty about future market conditions) 3. Institutional barriers (legal frameworks, lack of government support) 4. social & ethical barriers (lack of social acceptance, ethical issues)	No	Manufacturing industry	Enhance understanding of digitalization	Literature review	Matt et al. (2023)
Drivers 1. Intangible Inter-organizational (inter-firm cooperation along the supply chain, global networks, stakeholder engagement) 2. Intangible Intra-organizational (new digital skills, leadership, digital-supportive culture, advanced HRM practices, redefine organizational structures) 3. Technological (smart device, production system, software application, data analytics, infrastructures) 4. Institutional (Reshaping regulations, tailored education, training institutions)					

Drivers	No	-	Review DT conceptualization	Literature review	Morakan yane et al. (2017)
1. Determine the digital trigger					
2. Cultivate digital culture					
3. Develop a digital vision					
4. Determine digital drivers					
5. Establish digital organization					
6. Determine transformed areas					
7. Determine impacts					
Drivers			Understand how to accomplish DT and how DT affects organizations	Literature review	Osmund sen et al. (2018)
1. Supportive organizational culture					
2. Well-managed transformation activities					
3. Leveraging external and internal knowledge					
4. engagement of employees					
5. IS capabilities					
6. Dynamic capabilities					
7. digital business strategy					
8. business & IS alignment					
Drivers	No	-	Integrate DT literature	Literature review	Plekhan ov et al. (2022)
1. Organizational Core (Business models, Organizational structures, Organizational culture)					
2. Organizational periphery (Organizational processes, Digital servitization, Digital platforms)					
3. External environment (Supply chain management, Digital ecosystems, Cooperation with customers, Transperant dynamics, Sustainability)					
Barriers	No	Architec tural sector	Study digital innovation adoption	Quantitative (45 firms)	Ramilo & Embi (2014)
1. Financial barriers					
2. technological barriers					
3. organizational barriers					
4. psychological barriers					
5. process barriers					
6. governmental barriers					

Barriers 1. IT security issues 2. shortage of specialists in external labor market 3. lack of financing options 4. insufficient digital skills of employees 5. internal resistance to change 6. lack of knowledge of managers 7. uncertainty about future digital standards	Yes	Latvian organizations	Investigate barriers to sustainable DT in MSME's	Quantitative (425 surveys)	Rupeika-Apoga & Petrovska, 2022
Barriers 16 internal barriers, 7 external barriers	Yes	Nigerian sector	Determine DT barriers	Qualitative (7 interviews)	Rusu et al. (2022)
Barriers 1. Lack of vision 2. culture 3. skillset 4. infrastructure 5. budget constraints 6. teams working in silo 7. data security	No	Indian organizations	Explore DT barriers and their solutions	Qualitative (20 surveys)	Shahi & Sinha (2020)
Drivers 1. Looking for right talent 2. Agile methodology 3. Integrated/collaborative teams 4. Stakeholder engagement					
Barriers 28 barriers	No	Swedish IT company	Identify DT barriers	Qualitative (Case study & 5 interviews)	Sigari et al. (2021)
Barriers 1. Lack of human resources (knowledge & skills) 2. Strategic alignment of IT 3. Pressing inflation 4. Uncertainty 5. Possibility of a recession. 6. End of low-interest	Yes	European organizations	Explore the impact of DT on business activities	Quantitative (162 observations)	Skare et al. (2023)
Drivers 1. Skilled labor 2. Stakeholder awareness of DT importance 3. Managers' willingness to adopt					

Barriers 1. Functional/Department silo's	No	Large US firms	Conceptualize and investigate the microfoundations for DT	Quantitative (427 firms)	Sousa-Zomer et al. (2020)
Drivers 1. Digital-savvy leadership 2. Digital-savvy workforce 3. Risk-taking culture 4. Nimble and Agile structure 5. Multi-divisional structure (opposite to silo's) 6. External partnerships and technology-based acquisitions 7. Digital investments 8. Business performance					
Barriers 1. Lack of competencies 2. Lack of perceiving benefits by managers	Yes	Danish manufacturing sector	Investigate Industry 4.0 readiness barriers and drivers	Mixed method (190 survey respondents & 4 case studies)	Stentoft et al. (2021)
Drivers 1. Cost reductions 2. Legal requirements 3. Improved flexibility and robustness 4. Change in customer demands 5. Change in strategy					
Barriers 1. Internal barriers and management practices 2. Lack of resources and capability gaps 3. External barriers			Explore barriers in adoption of smart services	Qualitative	Toytari et al. (2017)
Barriers 1. Compete for digital talent with new digital entrants	No	-	Review the DT literature	Literature review	Verhoef et al. (2021)
Drivers 1. Digital assets 2. Digital agility 3. Networking capability 4. Agile/analytical internal IT structure 5. capital ability					

Barriers 1. inertia (due to resource or capability rigidity) 2. Resistance	No	-	Review DT literature	Literature review	Vial (2019)
Drivers 1. Changing consumer behaviors 2. Changing competitive landscape 3. Increasing availability of data					
Drivers 1. Organizational success factors (Pilot projects, Prepare for future, customer focus, autonomous production, employee qualifications, culture, data usage, management support, usability, interdisciplinarity) 2. Environmental success factors (connectivity, transparency, collaboration, hybrid value creation, standards) 3. Technological success factors (reliable/adaptable/available/relevant infrastructure, security, relevant/complete/real-time data)	No	Manufacturing industry	Examine success factors for DT	Qualitative (20 interviews)	Vogelsang et al. (2018)
Barriers 1. Missing skills (Lack of IT knowledge, Lack of information on technology decision-making, Lack of process knowledge) 2. Technical barriers (Dependency on technologies, Security in data exchange, Current infrastructure) 3. Individual barriers (Fear of loss of control over data, Fear of transparency/acceptance, Fear of job loss) 4. Organizational and cultural barriers (Keeping traditional roles/principles, Lack of vision/strategy, Lack of financial resources, Lack of time, Resistance to cultural change/mistake culture, Risk aversion) 5. Environmental barriers (Lack of standards, Lack of laws)	No	Manufacturing industry	Identify key barriers and success factors to DT	Qualitative (46 interviews)	Vogelsang et al. (2019)

Barriers	No	German (incumbent) multinational corporations	Explore dynamic capabilities required for DT	Qualitative (case studies at 7 organizations)	Warner & Wäger (2019)
1. Rigid strategic planning (Unwillingness to experiment with new business model archetypes, path dependencies)					
2. Change resistances (senior leadership without digitalization experience)					
3. High level of hierarchy (management of conflicting demand)					