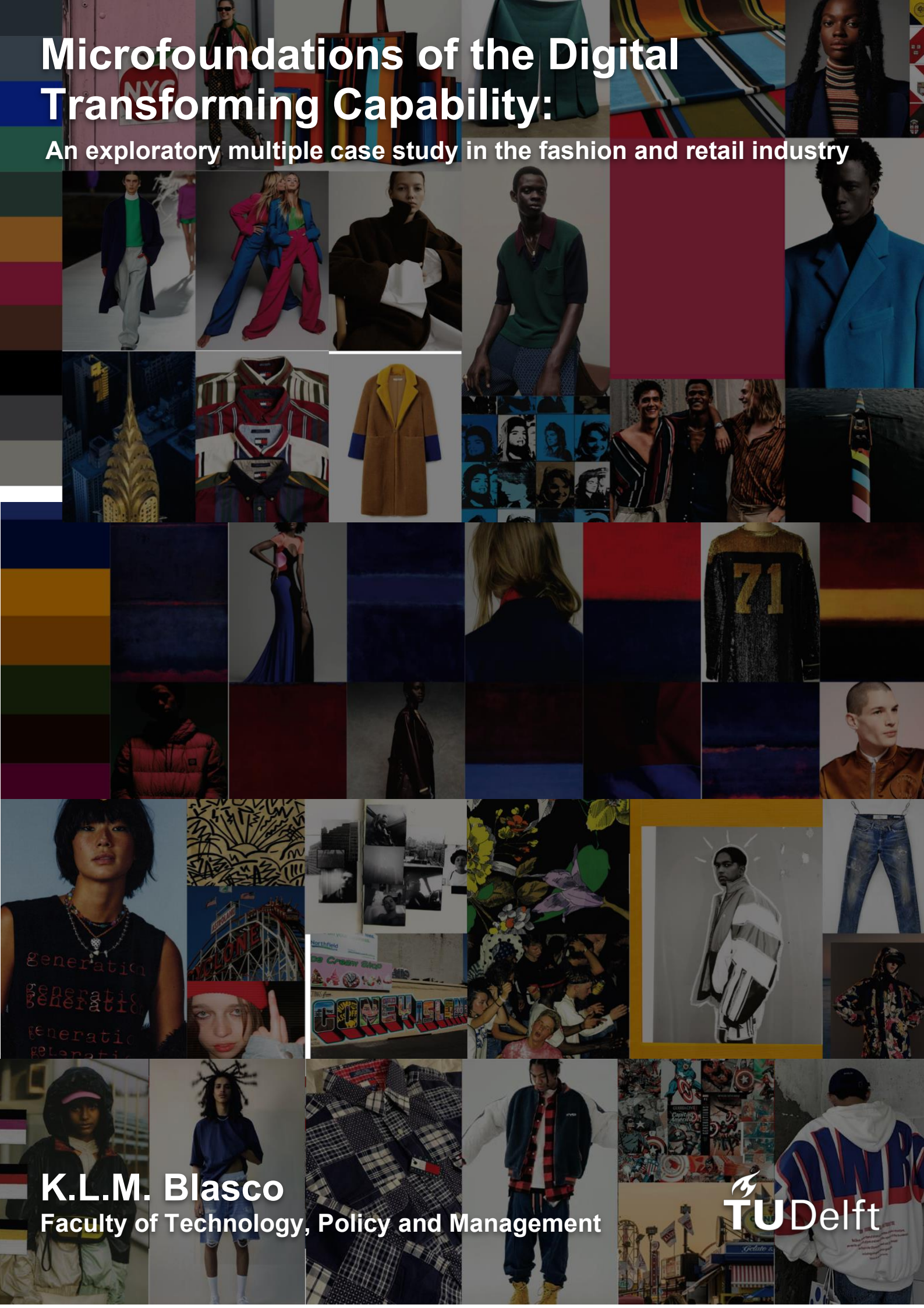
Microfoundations of the Digital Transforming Capability:

An exploratory multiple case study in the fashion and retail industry



K.L.M. Blasco

Faculty of Technology, Policy and Management

TU Delft

Delft University of Technology

Faculty of Technology, Policy, and Management

Microfoundations of the Digital Transforming Dynamic Capability

An exploratory multiple case study in the fashion and retail industry to investigate the underlying mechanisms of digital transformation through dynamic capabilities perspective

Master thesis submitted to Delft University of Technology in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

In Management of Technology

by

K.L.M. Blasco

Student number: 4658876

To be defended in public on

22nd of November 2021

Graduation committee:

First Supervisor	Dr. C. Werker	Economics of Technology and Innovation
Second Supervisor	Prof. dr. ir. MWFHA Janssen	Information Communication Technologies

This page was intentionally left blank

Executive Summary

The ubiquity of digital technologies has continued to permeate all firms and industries, piquing the interest of scholars and industrialists alike. As a result, incumbent firms are grappling with the reality of digitalization and utilizing the power of data. Digital transformation has become a hotbed of business model innovation, new value paths creation, and competitive advantage. However, despite the promises of greater integration of digital technologies into the firm, the question remains how legacy businesses can achieve this. In my thesis, I view this challenge through the lens of dynamic capabilities, the ability to transform the firm's resource base to align it to its changing external environment.

Dynamic capabilities theory is an explanatory framework that has gained academic and management attention for its ambition to explain sources of competitive advantage and guide managers to garner profits in highly competitive environments. For this reason, I conducted an extensive literature review exploring where the dynamic capabilities theory and digital transformation phenomenon intersect. The review resulted in the notion that digital transformation is a source of constant change that necessitates dynamic capabilities. These "higher-order" capabilities enable the firms to implement responses to digital disruption through their ability to sense threats and opportunities, seize them, and transform their resource base accordingly. However, the dynamic capabilities of the firm are not well understood. A stream of research has been flourishing to illuminate the origins of dynamic capabilities, known as the microfoundations of capabilities.

Based on the findings, I identified a knowledge gap as the microfoundations of the digital transforming dynamic capability. The concept relates digital transformation and dynamic capabilities through the firm-embedded processes to cope with technological change. On the one hand, digital transformation triggers change in the firm's characteristics through combinations of digital technologies. On the other hand, dynamic capabilities enable the firm's transformation. Thus the main research question of this thesis emerges: How do organizations in the fashion and retail industry build dynamic capabilities to execute their digital transformation strategy? In order to scope the microfoundation components of the dynamic capability, my study focuses on the low-tech sector of fashion and retail. Since it is an exploratory study, my thesis heavily focuses on a combinatory qualitative research technique to achieve a holistic analysis of the phenomenon.

The initial step to answering my research question led me to trace the history of digital transformation in IS research to understand how it became the impetus of change for firms. By reviewing the existing publications, I concluded that it had become a constant source of change for firms to match their internal resources to their external environment. Furthermore, reviewing research in dynamic capabilities revealed a framework that allows firms to respond to digital disruption through constant evolution in capabilities. My desk research uncovered the management research community's ongoing investigation of dynamic capabilities' underlying mechanisms known as microfoundations. Examining the microfoundations of dynamic capabilities showed that aggregated actions of individuals form routines that evolve into the firm's capabilities. Developing capabilities of any kind starts from the learning and collaboration of individuals with different skill sets, beliefs, and values that make up the organization.

As I used qualitative research, it was essential to build rigor in the research process. Hence I used an abductive approach throughout the case studies. Using abduction meant that after my first case study interview, I went back to the model of analysis to modify it to get more insights into the following cases. I approached three legacy firms in the low-tech sector of fashion and retail as a case study that exemplifies the problem of digital transformation. They were chosen based on profiles typical of a digitally-transforming firm, such as investments in digital technologies, the appointment of chief digital/information officers, size, and age. In addition to content, the firm's headquarter operations reside in the Netherlands, and their digital transformation initiatives occurred in the last five years. I consulted annual reports, financial filings, and company press releases to trace their digital transformation journey and validated through individual interviews from digital actors, people involved in the company's digitalization.

The empirical observations confirmed that the microfoundations perspective fits the research question due to the digital transformation's multi-pronged approach. However, I did not observe all sub-dimensions of the dynamic capability in the case study companies. Nevertheless, I found at least one of each factor relating to individuals, processes, and structures. For example, the individual dimension emerged in the study due to the central roles of leadership and the workforce's digital savviness in the transformation process. Furthermore, digital intensity (processual dimension) is a must in digital transformation since substantial digital technology investments are a core requirement. Their interaction and collaboration across different levels of the organization through proximity help build capabilities for digital transformation. The structural dimension also shows that a centrally organized digital initiative can move slower than a decentralized one.

My research suggests that digital transformation goes beyond technology implementation and tooling. The framework suggests that dynamic building capabilities are rooted in individuals learning and collaborating. Additionally, proximity and the concepts of multi-dimensional relationships (geography, cognition, social, and organizational) facilitate the learning process. My study also suggests that individuals working at different levels of the organizations build firm-level capabilities, which hints at the multi-level characteristics of capabilities of the firm. The research in microfoundations of capabilities has only caught traction in the last decade. Thus, the elements of my thesis form a foundation for future research.

For my father

Preface

“Success is not final; failure is not fatal; it is the courage to continue that counts.”

-Winston Churchill

This thesis fulfills the research requirement of the MSc Management of Technology at the Delft University of Technology. It presents the results of an exploratory study that aims to trace the microfoundations of the dynamic capability that organizations require to engage in the ongoing process of digital transformation. This research was possible in part due to the collaboration with Nike European Operations Netherlands B.V., PVH Europe, B.V., and adidas Group B.V.

First, many thanks to thesis committee supervisors Marijn Janssen and Claudia Werker for their patience and encouragement to get this thesis to the finish line. Second, thank you to Karen Stroobants, Eric Lagrand, Bhavya Mihira, and Spiros Tsoumpas at Nike EHQ; Sander Goldfinger at Adyen (previously adidas); Richard Feurstein, Gert Meiling, and Kruger Sla at PVH Europe for their insights into the dynamic world of fashion. Finally, my family and friends all over the world deserve so much acknowledgment for their love and support throughout my master’s.

Amsterdam, November 10, 2021

K.L.M. Blasco

MSc Management of Technology
Delft University of Technology
Faculty of Technology, Policy, and Management

This page was intentionally left blank

Table of Contents

List of Figures

List of Tables

List of Abbreviations

ABI	Analytics and Business Intelligence
APS	Advanced Planning and Scheduling
B2B	Business to Business
B2C	Business to Consumer
DC	Dynamic Capabilities
DCT	Dynamic Capabilities Theory
DCV	Dynamic Capabilities View
DMC	Dynamic Managerial Capability
DUI	Doing, Using, and Interacting
DTC	Direct to Consumer
DT	Digital Transformation
DSM	Demand and Supply Management
EDA	Enterprise Data Analytics
EHQ	European Headquarters
EMEA	Europe, Middle East, and Africa
FMS	Fashion Management System
IS	Information Systems
IT	Information Technologies
ITOT	IT-enabled Organizational Transformation
KSA	Knowledge, Skills, and Abilities
MPA	Marketplace Analytics
MVP	Minimum Viable Product
RBV	Resource-Based View
SA	South Africa
SME	Subject Matter Expert
TMT	Top Management Team
WE	Western Europe
WHQ	World Headquarters

Chapter 1 Introduction

I open this section with the overview of the chapter subdivided into six parts:

1. In section 1.1, I set the research in context.
2. In section 1.2, I present the current knowledge gap discovered in the preliminary literature review. In section 1.3, I identify the knowledge gap with the main research question and its three sub-research questions. In section 1.4, I further explain the societal and scientific relevance of answering the research questions.
3. In section 1.5, I outline the research objective and approach.
4. In section 1.6, I close the chapter with the fundamental research outline.

1.1 Background Information

In the sections below, I describe digitalization in the fashion industry and its challenges to incumbent firms. Then, I illustrate how companies cope with this challenge, according to the preliminary literature review.

The significance of digitalization in the fashion industry

Digital technologies have transformed the fashion industry as a whole (BoF, 2020). It has permeated how fashion companies interact with customers, deliver new products to market, and introduce innovative ways of operations. For example, customer interaction on mobile devices has become a new purchase channel. Recently this has been illustrated by social media giants Instagram (Facebook, inc.) and Tiktok (ByteDance Ltd.). The platforms have introduced in-app checkout to enable social media users to purchase items they see on posts (BoF, 2020). Another feature is visual search, which uses AI-powered image analytics to allow mobile users to identify apparel on the street or online to find similar items for instant purchase (BoF, 2018; BoF, 2019). Another exciting way fashion companies are introducing products to the market is through digital fashion and gamification. An example of this comes from fashion company Gucci (Kering) partnering with North Face and the role-playing game Pokemon GO!, where an in-game collection offers digital representations of its physical merchandise for sale. (BoF, 2020). In terms of innovating operations, improving analytics through AI and machine learning technology has helped brands to concentrate on a better assortment of products to increase sell-through and reduce overstock (BoF, 2020). The various ways digital technologies create new marketing channels, delight customers, and streamline operations reduce the lag between discovery, inspiration, and purchase for consumers.

The fashion system is going through a massive transformation to redouble its efforts to be closer to the customer and their tastes (BoF, 2018; BoF, 2019). The fashion system characterizes the businesses connected to fashion, from its artisans and their handmade products to multinational brands with integrated value chains that follow consumer trends and consumption (Steele and Major, 2015). These trends can be intrinsic such as the consumer seeking novelty or attractiveness, or external events not strictly fashion-related such as digitalization and globalization (Steele and Major, 2015). As a result, the proliferation of digital technologies such as mobile devices, AI, and 5G generated new ways for brands and consumers to interact, co-create, and produce new fashion trends globally (Bertola and Teunissen, 2018). Consequently, the fashion system's short

product life cycles, high demand volatility, low predictability of trends, and the lack of historical data to predict them are exacerbated by this digitalization (Bertola and Teunissen, 2018).

The digital transformation challenge for incumbent brands

Today, the fashion industry is grappling with digital disruption through many lessons learned and the potential for transformation to become an even more customer-driven sector (Bertola & Teunissen, 2018). The vehicle to this imagined reality is digital transformation (Bertola & Teunissen, 2018; BoF, 2018; BoF, 2019). Digital transformation is the capacity of firms to engage in increasingly digital environments and sustain it over time (Kane, 2017). Figure 1 conceptualizes how the fashion industry has digitalized its processes, business units, and components (Bertola & Teunissen, 2018). The enabling technologies, frequently abbreviated as SMACIT (Social, Mobile, AI, Cloud Computing, and Internet of Things) (Vial, 2019), set the foundation for transforming networks, products, and factories. Open and multipurpose enabling technologies impact their component processes through specific solutions to the business processes. The business components overlap with the research and design and product development as the nuclear process resulting in the products customers purchase (Bertola & Teunissen, 2018). These overlapping technologies and processes are guided by digital transformation principles: decentralization, modularization, interoperability, real-time capability, virtualization, and service orientation (Bertola & Teunissen, 2018).

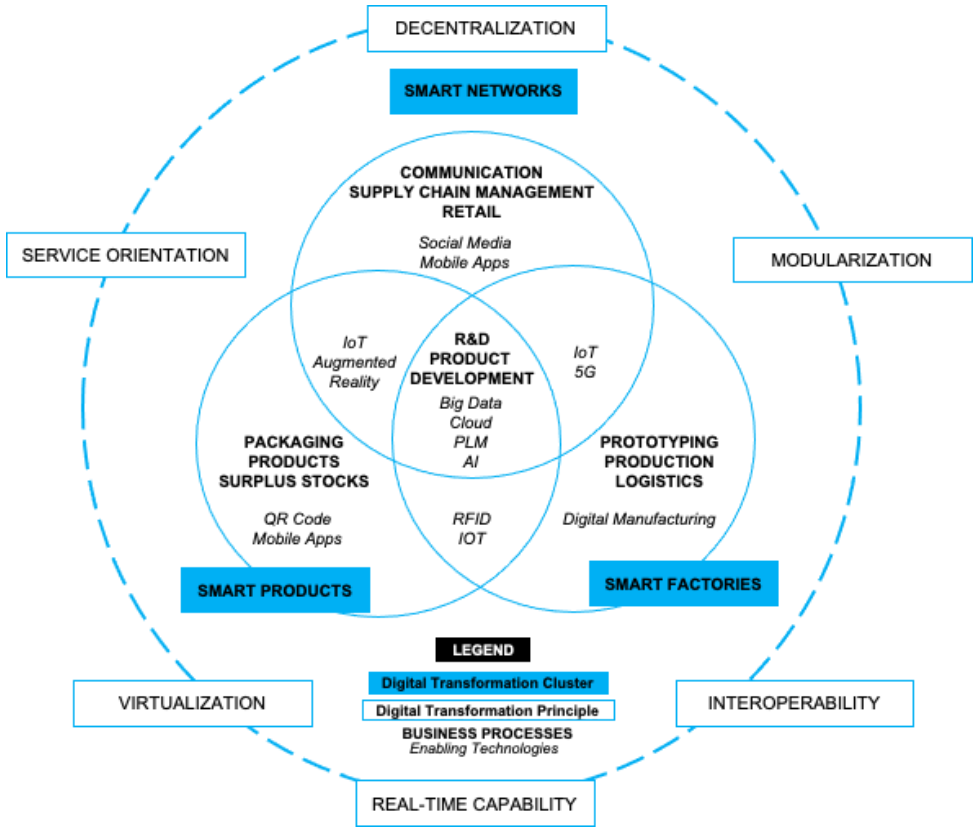


Figure1: Digital transformation clusters and principles in the fashion industry (adapted from Bertola and Teunissen, 2018)

Figure 1. Digital transformation clusters and principles in the fashion industry (adapted from Bertola & Teunissen, 2018).

Digital transformation and the dynamic capabilities framework

Digital transformation has eluded even the most motivated leaders in incumbent firms (Matt et al.,2015; Hess et al., 2017). It is the vehicle that enables incumbent companies to traverse the digital landscape as new technologies emerge and customer tastes change (Kane et al., 2017). Furthermore, digital transformation presents a challenge unique to traditional firms because they have to balance exploiting their current capabilities while building new capabilities for the digital economy (Teece, 2018; Warner & Wäger, 2019). This tension has recently become more evident in fashion, and it is an essential context for strategic renewal. As discussed in 1.1.2, the industry has experienced many digital technologies creating new opportunities and threats to engage with consumers. They create new value creation paths alongside new challenges (Vial, 2019).

Accordingly, the Dynamic Capabilities Theory (DCT) has become relevant in the setting of the digital transformation of traditional companies because it guides how incumbent firms can respond to rapid technological change in the market (Teece et al., 1997; Eisenhardt & Martin, 2000; Helfat et al., 2007; Teece, 2007). It is an explanatory framework on how firms can create, extend, and modify their resource base (Helfat et al., 2007). The model divides into three main processes: (1) sensing opportunities (and threats), (2) seizing opportunities, and (3) transforming the organization's broader resource base (Teece, 2007). Given the transformational effects of digitalization, using the DCT framework is a valuable lens on how traditional companies can navigate digital transformation (Warner & Wäger, 2019). Despite growing research in building dynamic capabilities, research on building these capabilities in the digital transformation setting still lacks.

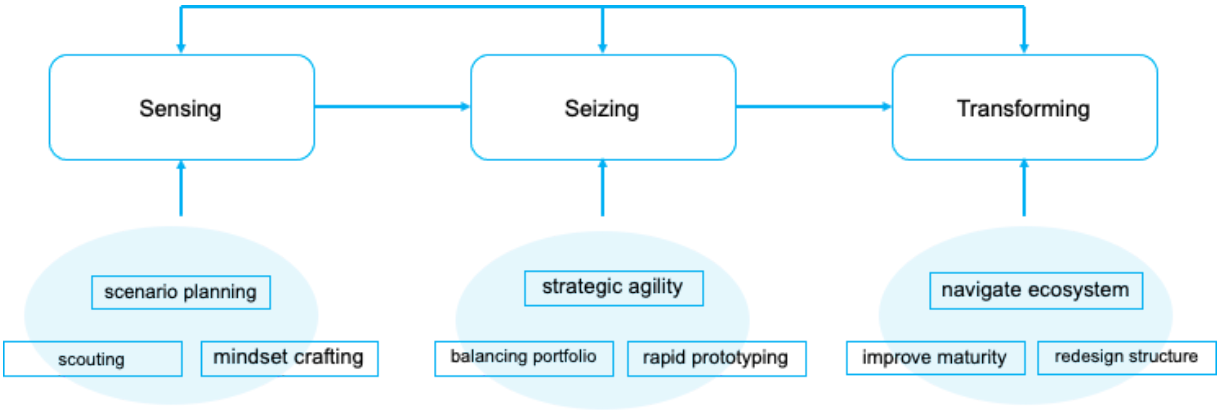


Fig. 2 Preliminary concept of the Dynamic Capabilities for Digital Transformation (adapted from Warner and Wäger, 2019)

Current scientific understanding of the provenance of dynamic capabilities for digital transformation is nascent (Warner and Wäger, 2019; Souza-Zomer et al., 2020). First, the sensing dynamic capability focuses on the local and external search for opportunities in the firm and its external environment (Helfat et al., 2007; Teece, 2007). Relating sensing to digital transformation means scouting digital talent, crafting a digital mindset, and scenario planning for a long-term digital vision (Warner & Wäger, 2019). Second, seizing opportunities relates to deciding which opportunities to pursue and architecting how firms can achieve them (Teece, 2007). In digital transformation, this means strategic agility, balancing the digital investments portfolio, and rapid prototyping for digital products (Warner & Wäger, 2019). Finally, transforming relates to reconfiguring the firm's tangible and intangible assets to sustain firm growth and profitability, given its presence during the seizing phase (Teece,

2007). In digital transformation, this means adeptly navigating the firm's digital ecosystem, redesigning its internal structure, so it is congruent to its external environment, and continually improving its digital maturity (Warner & Wäger, 2019). Although authors recognized these organizational dynamic capabilities, it remains unexplored what are the micro-level components to build those capabilities (Sousa-Zomer et al., 2020).

1.2 Problem Statement

Scant literature calls for more research on exploring the process of building dynamic capabilities for digital transformation (Warner and Wäger, 2019; Vial, 2019). Digitalization has dramatically reshaped businesses and economies, urging companies to prioritize digital transformation to remain relevant in the marketplace. The imperative includes the low-tech retail industry, especially fashion, where digital players have gained disproportionate success and pose threats for incumbent players (BoF, 2020). According to consulting firm McKinsey, e-retailers saw a 42% higher return than their physical peers during the pandemic (2020). This trend has been going on for the majority of the past decade, where early digital adopters have gained disproportionate shares in the market (Manyika et al., 2015). Hence, incumbent companies now confront how to respond to the new market dynamic. As a response to the dynamic external environment, digital transformation focuses on how digital technologies can change a firm's business model, which can change its product and service offerings along with its organizational structure (Hess et al., 2016). This paradigm shift challenges established firms within the traditional sectors because they need to exploit existing capabilities while building capabilities congruent with their path dependencies and already-existing capabilities (Svahn et al., 2017). However, this tension has only been preliminarily studied in the context of digital transformation.

Despite this crucial tension, limited literature exists on exploring the process of building dynamic capabilities for digital transformation. Therefore, Warner and Wäger investigated a sample of the incumbent firm's strategies for digitalization from a DCT perspective. Their research on dynamic capabilities for digitalization resulted in three factors: business model, a collaborative approach, and culture (2019). While there is much literature on how business models and dynamic capabilities are intertwined (Teece, 2007; Teece, 2014; Teece et al., 2016), they extended this idea to add a collaborative approach, and eventually, culture contributes to strategic change within the process of digital transformation. While the study reported emergent findings from the automotive, energy, and telecom industries, the study did not include traditionally low-tech industries like retail and fashion.

In terms of industries continually impacted by digitalization, the previous sections have illustrated that digitalization has impacted applications and processes in the fashion industry (Manyika et al., 2011; BoF, 2018, 2019, 2020, 2021). However, compared to other industries, fashion has gotten less attention in terms of digital transformation research. This gap is due to the fashion industry traditionally observed through a supply chain network perspective rather than a socio-technological innovation lens (Delbufalo, 2015; Bertola & Teunissen, 2018). Nevertheless, a Business of Fashion and McKinsey & Company study shows that 70 percent of fashion executives see digital as the most significant upside for 2021, expecting growth of their e-commerce business to exceed 20 percent (2021). Furthermore, recent years have shown, now augmented by the ongoing

COVID-19 pandemic, that the need for digital innovation is vital for the strategic renewal of fashion companies. While brick-and-mortar companies like Primark and H&M have billion-dollar inventory problems due to heavy reliance on foot traffic, digital companies like Amazon and Farfetch reach new heights in valuation with digital platform business models (BoF, 2020). Such stories imply that incumbent fashion companies must seriously consider their digital strategy.

1.3 Research Questions

With the problem statement established, this thesis aims to answer the following research question:

How do organizations in the fashion and retail industry build dynamic capabilities to execute their digital transformation strategy?

To answer this central research question, the following sub- research questions follow:

1. *How does the dynamic capability view define the digital transforming capability?*
2. *What are the building blocks of digital transforming capability according to extant literature?*
3. *How do individuals and routines contribute to building the dynamic digital transforming capability?*

Answering these research questions offers the following theoretical contributions:

1. Explore the micro-level foundations to build the capability to execute a digital transformation strategy and reconfigure their resource base to adapt to the digital age.
2. Provide empirical evidence of how incumbent firms in traditional industries build the digital transforming capability.
3. Compare microfoundation of the digital transforming capability of traditional industry incumbent firms to those of high-tech industry incumbent firms.
4. Disaggregate the high-level construct of dynamic capabilities and their antecedents.
5. Investigate how firm-level capabilities can disaggregate into their underlying routines.

1.4 Research Contributions

My thesis expands the existing knowledge on the underlying mechanisms that create incumbent firms' digital transforming dynamic capability. It addresses the increasing scholarly interest in dynamic capabilities and digital transformation concepts in strategic management. Furthermore, it combines collaboration literature and strategic management literature in explaining how microfoundations of capabilities contribute to the creation of dynamic capabilities. This study also adds empirical evidence to the creation of dynamic capabilities in firms and theoretical contributions to manage digital transformation in a traditional industry. In particular, it helps managers gain knowledge on dynamic capabilities and how they can help manage digital transformation at different levels of the firm. While I conducted my study in the fashion industry, other traditional industries like fast-moving consumer goods can also gain insights. Moreover, suggestions emerging from this study serve as a basis for future research.

1.5 Research Objectives and Approach

Qualitative research will be conducted among global apparel and footwear brands with headquarters and offices in the Netherlands. The research will be an exploratory multiple case study to focus on a contemporary phenomenon within some real-life context (Yin, 2003). Multiple case studies help determine whether the findings for one case also occur in other cases, thereby responding to the need to generalize from these findings (Saunders et al., 2016). Moreover, a multiple case study enables researchers to explore differences and similarities between cases (Baxter & Jack, 2008). Furthermore, while preliminary theories are included a priori, the theoretical framework will be iterated as themes emerge in the data collection process (Charmaz, 2006). As such, the research strategy also has exploratory features. My thesis will be multi-method qualitative research, as data will be gathered initially through analyzing existing literature for the literature review, on which I examine preliminary theories to explore the research question. I then follow with the empirical research done through interviews and document analysis to complement the empirical findings (Bowen, 2009). As such, the research approach is abductive, as the thesis's objective is to derive a framework by evaluating existing literature (Saunders et al., 2016). Finally, my research will be cross-sectional, as I investigate the incumbent firms at a particular point in time (Saunders et al., 2016). Cooperation with my professional network through internships and companies of interest provides the necessary participants for the study.

1.6 Research Outline

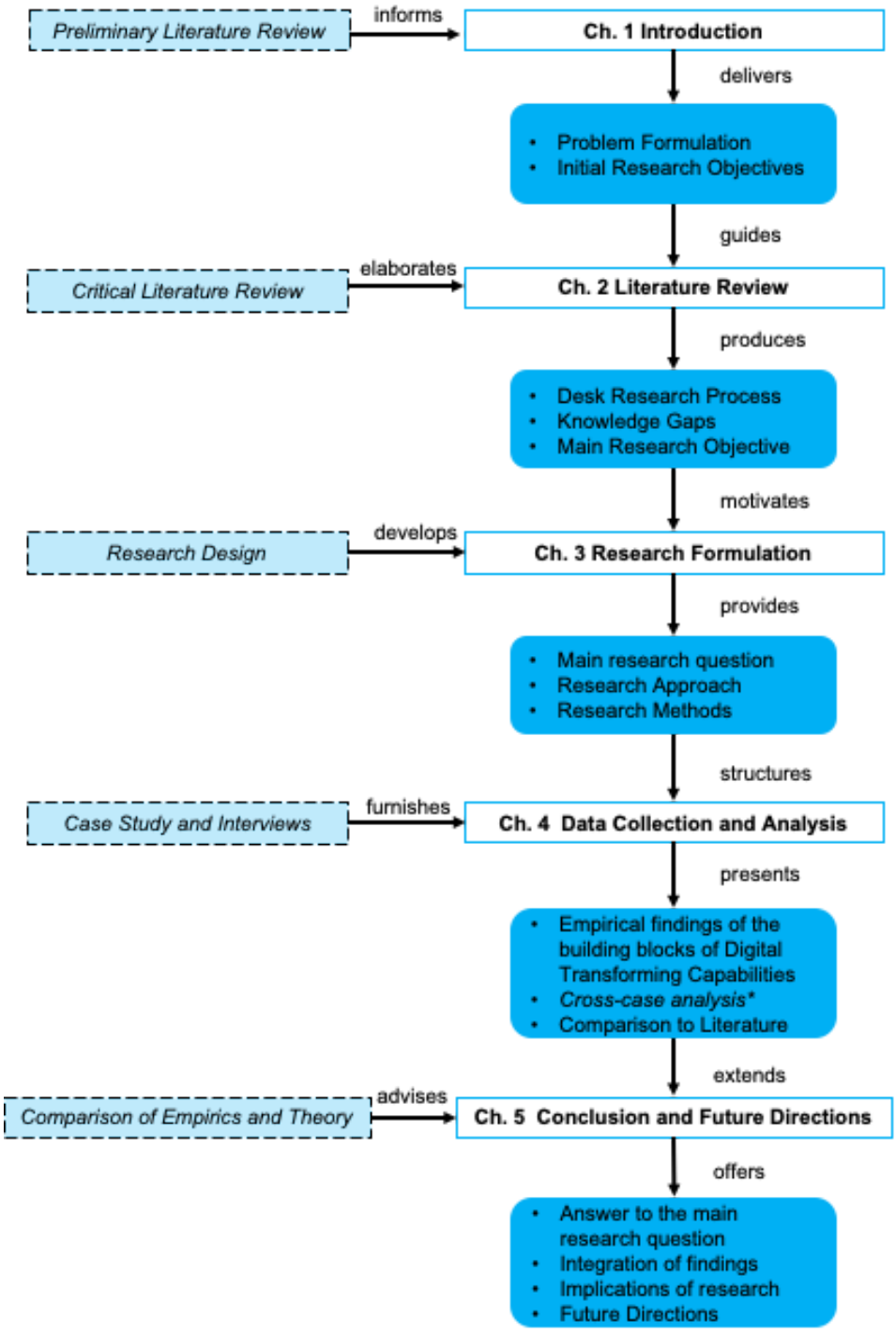


Figure 3: Research flow diagram

Chapter 2 Literature Review

In Chapter 2, I place my research in context among literature in digital transformation (DT), dynamic capabilities (DC), and microfoundations of DCs. Its purpose is to answer the first research subquestion: “How does the dynamic capabilities view define the digital transforming capability?” I answer this inquiry by presenting a theoretical overview of the aforementioned major themes to motivate why the dynamic capabilities perspective helps conceptualize digital transformation.

A theoretical perspective comprises most of the literature review, starting with the first section with an overview of DT. I conjecture that DT sets the context of continuous change for which DC’s are necessary. DT affects multiple facets of an organization and beyond, which requires constant adaptation and evolution. This ongoing process differs from previous research on IT-enabled organizational transformation (ITOT), which has long contributed to the firm’s transformation potential. It varies due to its target entity, scope, means, and expected outcomes.

As a source of continuous change, DT provides a catalyst for how DCs evolve within the organization. In the following section, I offer a theoretical perspective to the DT phenomenon through the DCT perspective. I conclude this chapter with the knowledge gaps, which I will empirically address in the subsequent chapters.

2.1 Desk Research Method

The bulk of my research consisted of the literature review, starting with desk research to create a theoretical frame of reference. As mentioned, this covers DCs within the DT setting, with a focused perspective on the microfoundations theory and the underlying mechanisms of ordinary and dynamic capabilities. Within the context of DT of the retail industry and the three theories identified in the preliminary literature review, my study pulls from the literature on DT, DCs, and microfoundation of DCs. The first theory allows insight into the patterns seen in the industry in coping with digitalization. Then this theory is further explained through DCs and how firms respond to technological change in their external environment. Moreover, the microfoundations perspective further deconstructs the organizational capability into its subcomponents to clarify how firms in the industry differ and exhibit similar patterns (Teece, 2007; Warner & Wäger, 2010; Souza-Zomer *et al.,* 2020).

I constructed the literature review through the snowball method (Charmaz, 2006; Saunder *et al.,*2016). As stated previously, there has been a proliferation of research in dynamic capabilities. Figure 4 illustrates how this has grown in the past two decades from searching multiple databases through the search engine Web of Science on “Dynamic Capabilit*” with over 6000 publications. I further reduced the results by using keywords such as “Digital Transformation” and the specific theory of “Microfoundation*.” I continued to refine the results to 132 articles, of which I skimmed the abstracts to ensure the contents were relevant to my study.

Furthermore, critical articles were identified as foundational and used as a starting point of the snowball based on their citations. I used the AI-powered search engine Semantic Scholar to search relevant articles and then verified again through strategically

speed-reading the articles (Booth *et al.,* 2008). My process resulted in the frame of reference presented in section 2.6. Then the frame of reference will be used as a basis for the abductive, multiple-case study research outlined in the subsequent chapters.

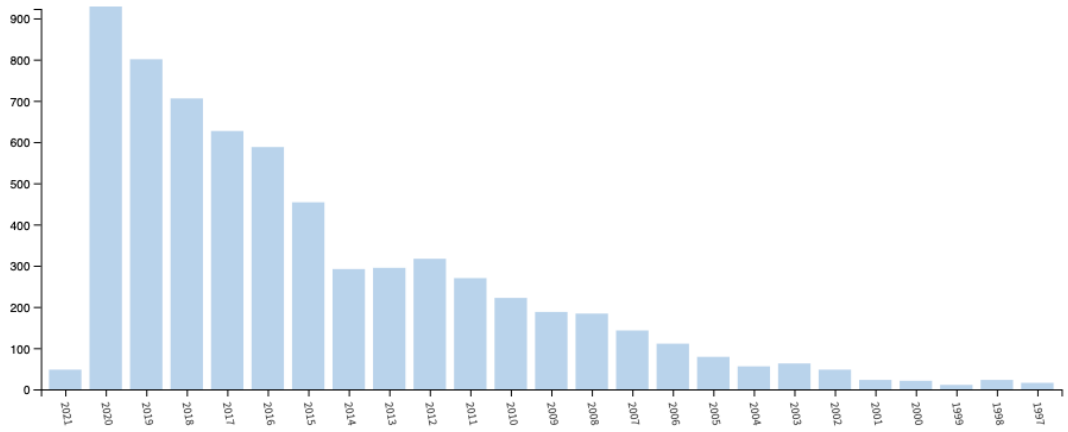


Figure 4: No. of DC publications from 1997-2021 (Web of Science)

The outcome of the case studies will allow new hypotheses to emerge on how the firms can build the dynamic digital transforming capability. In addition, the findings from the cases will illuminate new insights on the sub-components of the microfoundations necessary to construct the digital transforming capability. Finally, as a pragmatic result of my research, my findings will inform firms on navigating and engaging with digital transformation. It is essential to highlight that due to the novelty of the theory, the case studies represent industry-specific findings that further research builds on through different methods such as surveys.

2.2 Digital Transformation

Digital transformation and IT-enabled organizational transformation

Thus far, DT appears to be an imperative for incumbent companies to stay relevant in today's digital landscape (Tanriverdi & Lim, 2017). However, successfully executing DT eludes even the most willing top management teams (Hess *et al.,* 2016). Still, literature has long-established and widely acknowledged that IT has transformative potential (Vial, 2019). Furthermore, IT strategy and organization science research have long supported that IT enables its business strategy and competitive opportunities (Tallon *et al.*, 2013). Thus, a question remains on how DT differs from ITOT besides their semantics. Literature suggests that there are two distinct differences between the two phenomena. First, on the one hand, DT (re)defines an organization's value creation paths and value proposition through leveraging digital technologies; on the other hand, ITOT leverages digital technologies to support the firm's existing value creation paths and propositions. Secondly, DT involves a new organizational identity, while ITOT enhances the firm's existing identity (Wessel *et al.*, 2021). Since a parallel exists between ITOT and DT, DT will be defined and characterized as an evolution of ITOT in this section. I will outline DT's building blocks and discuss how the Dynamic Capabilities Theory (DCT) can support viewing the DT phenomena.

Tracing DT Foundations in IS research

The notion of utilizing IT to align a firm's strategic business objectives guides how scholars conceptualize transformation today. The literature characterizes IT transformation as a means of alignment from diverse angles: business process re-engineering, IS strategy, or practice research (Wessel et al., 2021). These broad research streams commonly look at how organizational contexts in combination with IT systems impact transformation and address why strategic IS implementation and achieving alignment are challenging endeavors (Hsu *et al.,* 2018*;* Tallon *et al.,* 2013*;* Wessel et al., 2021). Scholars have offered possible explanations, such as the time intensity of incremental process alignment with existing practices or aligning the motivation of executives who designed the transformation with the motivation of organizational members tasked to carry them out (Matt *et al.*, 2015). These notions are still relevant to recent DT research because implementing digital technologies aligns business strategy and improves business outcomes but from a much broader perspective.

Conceptual Clarity of DT

Although the proliferation of research of DT in strategic IS research in recent years, a lack of a comprehensive understanding of the concept persists (Vial, 2019). Researchers posit that the lack of cohesion of the DT phenomenon is due to the circularity, unclear terminology, and the blending of the concept and its impacts (Vial, 2019; Warner & Wäger, 2019). For example, the definition "The use of technology to radically improve performance or reach of enterprises" (Westerman *et al.*, 2014) combines the DT concepts and their impacts (Vial, 2019). Though firms pursue DT, improved outcomes are not guaranteed (Vial, 2019; Sousa-Zomer *et al.*, 2020). The lack of strategy alignment, clear goals, experience in business transformation, financial means, and value-creating paths contribute to the slew of reasons DT fails (Matt *et al.,* 2015). Therefore, the DT concept must be separated from its intended impacts, suggest some scholars (Vial, 2019). Thus, Vial offered four essential properties to decompose the DT concept: (1) the *target entity*, i.e., the entity impacted by DT; (2) the *scope* and extent of changes occurring within the target entity; (3) the *technological means* facilitating change in the entity and finally, (4) the *expected outcome* of the transformation (2019). With these four properties, the working definition for DT in my thesis then becomes: "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).

Properties of Digital Transformation

Given the four properties of DT, its novelty can then be compared to the prior literature of ITOT and argued as its evolution (Vial, 2019). First, DT's target entity is the organization, platform, ecosystem, industry, and society. On the one hand, due to the target entities of DT, its scope also transcends the organization and its immediate network, e.g., society at large (Tanriverdi & Lim, 2017). On the other hand, ITOT can be profound, but it is limited to an organization's processes and network, i.e., suppliers. IT-enabled innovation affects only a single organization and perhaps its immediate value network.

Furthermore, the means through which IT-enabled transformation relies mainly on one single IT artifact focused on an operation such as an ERP system as opposed to many technologies or a combination thereof, usually shortened to the SMACIT acronym (Social, Mobile, Analytics, Cloud, and Internet-of-Things) (Vial, 2019). Finally, the expected outcome differs between the two phenomena. DT transforms business processes and the firm's business model while ITOT optimizes and gains efficiency in existing business processes (Bharadwaj, 2013).

Wessel and colleagues also distinguish DT and ITOT through the concept of organizational identity (2020). This concept complements ways of visualizing various transformations because scholars have recognized that digital technologies can create new value creation paths and propositions (Yoo et al., 2010). For example, Nike has transformed from a shoe and equipment retailer to a digital sports platform (e.g., Nike+ health sensors on Apple smartwatches, Running Training Club (RTC) app, and partnerships with e-commerce platforms) (Warner & Wäger, 2019). Figure 5 below shows how two different streams of transformation can create a new organizational identity or reinforce an existing one. The authors claim that technological change drives the organization's technical agenda on whether to keep the organization's identity with the support of digital technologies or claim a new identity altogether driven by digital technologies. Using longitudinal studies of two companies going under transformation, a manufacturing company wanted to change its identity as a "trusted digital partner" due to competitive industry pressure to offer digital products and services. In contrast, a healthcare company wanted to keep its organizational identity constant while still "becoming more digital" to support its efficiency ambitions (Wessel *et al.*, 2020). Furthermore, digital technologies are more integral to the manufacturing company's value path creation in its DT. At the same time, it only supports the healthcare company to deliver its value proposition, i.e., provide care, in its ITOT. In short, ITOT supports organizations to become better at what they do while DT redefines the value proposition to become providers of digital products and services (Wessel *et al.*, 2020).

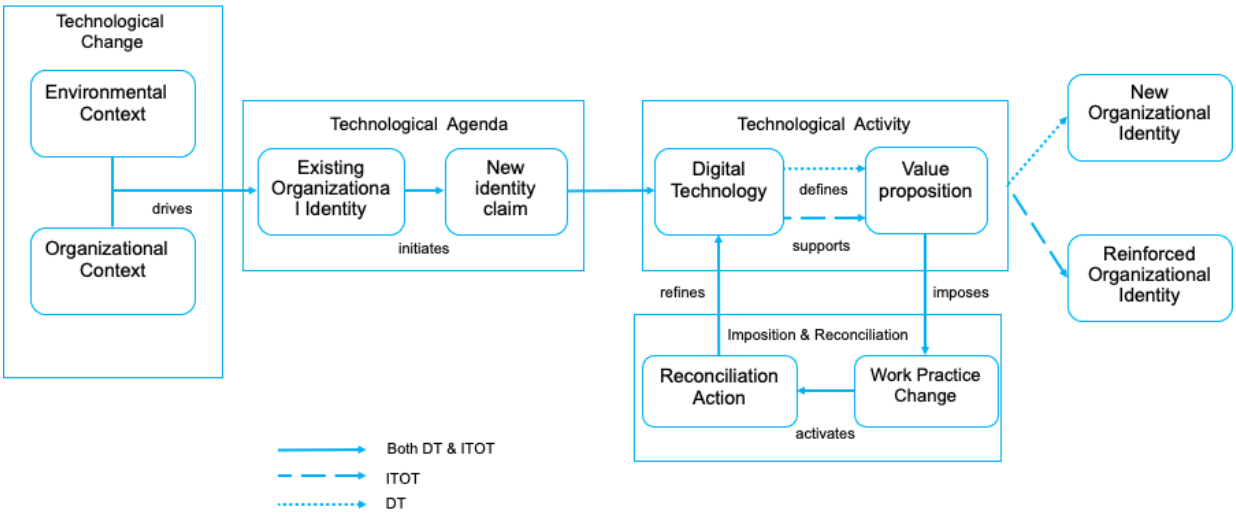


Figure 5 Process Model of Transformation (adapted from Wessel et. al, 2020)

Building Blocks of Digital Transformation

Vial also puts forth a process model that puts digital technologies at the center of the DT phenomenon (2019). In the author's model presented below in Figure 6, digital technologies fuel industry disruptions that trigger a strategic response for a digital strategy and DT, which in turn relies on digital technologies (2019). In light of this relationship, Matt et al. characterize digital business strategy as describing the future business opportunities partly or entirely based on digital technologies. In contrast, the DT strategy is a blueprint that integrates digital technologies implementation and operations thereafter (2015). Indeed, Bharadwaj and colleagues implore that firms must fuse digital and business strategy concepts rather than just align them(2013). These strategic responses address the disruptions that digital technologies fuel, such as consumer expectations, data availability, and the competitive digital landscape (Vial, 2019). These disruptions deeply permeate the fashion industry, such as how digital innovations have changed the nature of customer and brand interaction to create highly personalized shopping experiences (BoF, 2021). For example, the Nike app allows users to create customized shoe designs from given base models, which requires a highly responsive supply chain to fulfill customer demand (Bertola and Teunissen, 2018). The Nike example illustrates how digital technologies can create new value creation propositions (i.e., personalization) and value networks (i.e., digital manufacturing). However, as literature shows that digital can profoundly change the organization, firms must consider complex changes in its structure, culture, and employee roles and skills. Furthermore, managers must reconcile organizational barriers such as inertia and resistance. Therefore, digital technologies' impact on value creation paths can both generate positive and undesired effects (Vial, 2019).

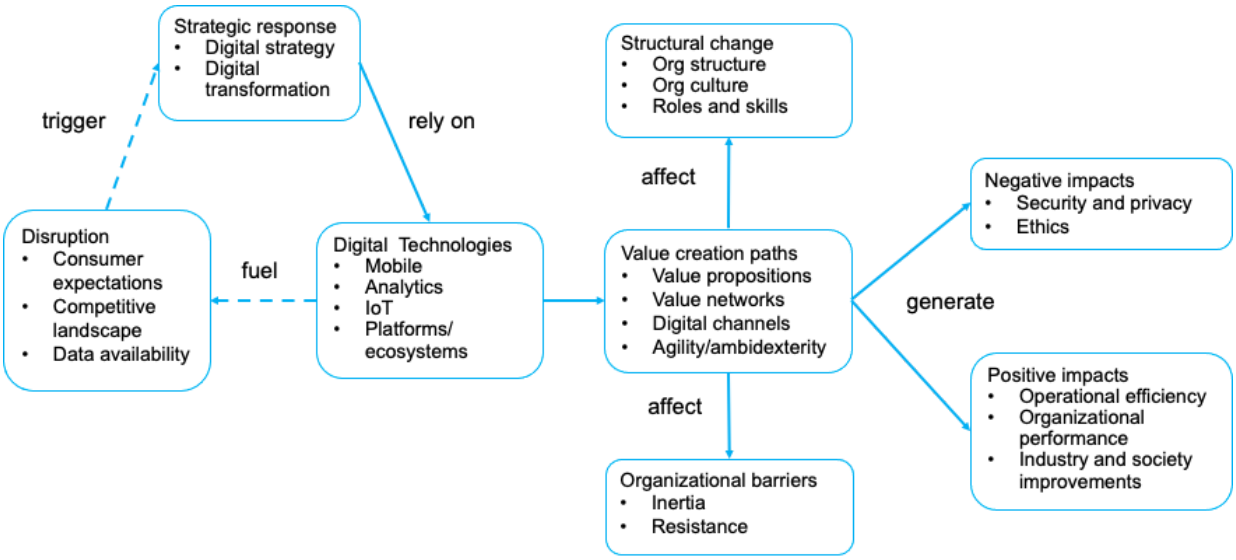


Figure 6 model representing the sequence of relationships by DT literature (not causality) (Vial, 2019)

The value creation paths Vial mentions in the previous process model can be attributed to business model innovations based on digital technologies (Warner and Wäger, 2019). In my thesis, I define a business model as "an architecture for how a firm creates and delivers value to customers and the mechanisms employed to capture a share of that value" (Teece, 2018). Through business model design, firms can commercialize a given technology and significantly impact firm performance (Kapoor and Teece, 2021). In essence, business model innovations outline how digital technologies realize a firm's digital and

transformation strategy and create new value paths. As such, firms must align their internal structure and transition to business models that fit comfortably to become far easier to implement (Teece, 2018). Teece suggests that firms must consider the necessary structural changes and barriers to implement a business model that creates, delivers, and captures values.

2.3 Dynamic Capabilities Theory

The previous section showed how DT has evolved from ITOT research in recent decades. It also showed how the properties of DT create a constant source of change within the firm and its ecosystem. The following section will then explain the DCT, and it can guide managers to engage with DT.

Dynamic Capabilities Theory

The Dynamic Capabilities Theory (DCT) framework has gained traction in the strategic management research community in the last two decades due to its ambition to explain how firms can achieve competitive advantage in dynamic markets (Teece, 2007; Easterby-Smith *et al.*, 2009). Teece developed the framework to offer managers guidance on achieving and sustaining competitive advantages within the context of an increasingly diverse, global, and open market for innovation, invention, and manufacturing (1997). The subsequent research has expanded, debated, and challenged this concept on its definition, nature, and consequences on firm performance (Easterby-Smith *et al.,* 2009; Ambrosini & Bowman, 2009; Barreto, 2010; Wang & Ahmed, 2007). The result of two decades of prolific research has pulled from fields beyond strategic management such as economics, psychology, sociology, decision sciences (Helfat *et al*., 2007) as well as specialized areas in business administration, e.g., human resource management, operations management, information management, and entrepreneurship (Barreto, 2010). Progress in the research field resulted from many (re)combinations of theories and traditions, which contributed to the DCT conceptualization but also added to its complexity (Easterby-Smith *et al.,* 2009).

Research in DCT to date has created distinct definitions and streams of investigation to develop its conceptualization further. Though the concept was first introduced in 1994 by Teece and Pisano, the seminal 1997 work by Teece, Pisano, and Shuen garnered the most interest in this field of research (Barreto, 2010). The authors introduced the DCT concept to fill in the gaps in the previous studies in the firm's Resource-based View (RBV) (Teece *et al.,* 1997). The RBV conceptualized the firm as a bundle of resources and proposed that resources that are VRIN (valuable, rare, inimitable, and substitutable) can create sustained competitive advantage through irreplicable value-creating strategies (Barney, 1991; Martin and Eisenhardt, 2000). The DCT contributed to the RBV perspective by its dynamic perspective, whereas others viewed the RBV as a static view of the firm(Teece *et al*., 1997; Teece 2007; Barreto, 2010). RBV lacked an explanation on how the market dynamism affects the firm's VRIN resources, and DCT fills that gap by creating a framework that shows how firms react to market changes by changing their internal mechanisms (Teece *et al.,* 1997; Eisenhardt & Martin, 2000). The DCT framework also aims to clarify differences among resources and capabilities that create sustained competitive advantages and the mechanisms that produce them, which RBV bundled as the same (Wang and Ahmed, 2007). Still, it is unclear whether the research field has prevailed over definitional issues (Wang & Ahmed, 2007; Easterby-Smith *et al.,* 2009).

The wide range of fields that contribute to the DCT body of work has not yet converged on a widely accepted definition (Ambrosini & Bowman, 2009; Easterby-Smith *et al.,* 2009). The first definition from Teece et al.'s seminal work gained traction, which defines dynamic capabilities as a "firm's ability to integrate, build, and reconfigure internal and external to address rapidly changing environments" (1997). Then, several researchers have contributed to its definition, often reflecting their research backgrounds (Easterby-Smith *et al.,* 2009). Eisenhardt and Martin describe DCT as processes that vary with the market's dynamism (2000). Others offered definitions focused more on its nature. DCT has been conceptualized in terms of collective activity to evolve the firm's operating routines (Zollo & Winter, 2002; Salvato & Rerup, 2011); a capacity to purposely change the firm's resource base (Peteraf *et al.*, 2007); a behavioral orientation to modify its resources and core capabilities (Wang & Ahmed, 2007). Researchers commonly cite the DCT framework as the capacity (1) to *sense* and shape opportunities and threats (2) to *seize* opportunities and (3) to maintain competitiveness through enhancing, combining, protecting, and when necessary *reconfiguring (transforming)* the business enterprise's intangible and tangible assets (Teece, 2007; Helfat *et al.,2007*). The many definitions show similarities and the difference in the theory and how they are applied.

Many characteristics of DC's have been discussed and challenged (Ambrosini & Bowman, 2009). In a general sense, there is some consensus in the construct's conceptualization. The literature reveals that the framework is seen as organizational processes that are path-dependent, embedded in the firm, and built rather than bought from the market to respond to change (Teece *et al.*, 1997; Martin & Eisenhardt, 2000; Zollo & Winter, 2002; Teece, 2007; Wang & Ahmed,2007). However, I highlight that the source of contention in the research stems from its effects and consequences in terms of firm performance and market advantages (Easterby-Smith *et al.,* 2009). Teece and colleagues (1997) link dynamic capabilities to competitive advantage one-to-one, while others propose an indirect relationship to the firm performance that can produce failure, parity, or success (Martin & Eisenhardt, 2000; Ambrosini & Bowman, 2009; Senivongse *et al.*, 2019). In addition, Helfat and colleagues assert that the direct relationship between dynamic capabilities and competitive advantages is self-referential and tautological (2007). The nature of the relationship between the DCT framework and firm performance, let alone competitive advantage, is still a topic of interest in the research.

2.4 Microfoundations of Dynamic Capabilities

To increase the conceptualization and functionality of the DCT framework, scholars have called for more investigation to understand the mechanisms underpinning the so-called higher-level capabilities of the firm (Helfat *et al.*, 2007). Therefore, in the next section, I outline the research in the microfoundations of DCs, how they develop, where they are in the organization, and firms activate them.

Microfoundations of Dynamic Capabilities

A burgeoning research area within the DCT field, microfoundations concerns itself with the nature, origins, and evolution of dynamic capabilities to fill in the gaps in the framework (Bojesson and Fundin, 2020). Teece *(*2007*)* defines the microfoundations of dynamic capabilities as *"the distinct skills, processes, procedures, organizational structures, decision rules and disciplines that support the sensing, seizing and reconfiguring abilities."* Felin *et al*. (2012) define microfoundations as *"a theoretical explanation supported by an empirical examination at an analytical level N-1 of a phenomenon located at an*

analytical level N." Felin and colleague's definition points to the conceptual definition that decomposes higher-level capabilities into its subcomponents. As previously discussed, dynamic capabilities are responses to the need for change or a new opportunity that affect the firm's resource base, including human capital, technological capital, knowledge assets, and tangible and intangible assets (Easterby-Smith *et al.,* 2009). With their wide range, studies theorize DCs assume different roles in the organization among different levels, such as search routines, knowledge transfer, resource allocation and acquisition, decision making, leadership, and governance (Teece, 2007). Thus, with a wide range of activities and processes, researchers have referred to the construct as a capacity (Helfat *et al.*, 2007), resources and routines (Martin & Eisenhardt, 2000; Teece 2007), or explicitly as routines (Winter & Zollo, 2002; Salvato & Rerup, 2010). To further elucidate the concepts of capabilities, researchers opted for two or even three-tiered capability hierarchies. Zero-level capabilities are ordinary capabilities for operational activities, while higher-level capabilities modify zero-level capabilities to solve strategic problems (Winter, 2003). Similarly, Zollo and Winter propose two levels of capabilities: operational capabilities, which allow the firm to earn a living, and higher-level capabilities, which would enable the firm to profit (2002). The literature has then expanded on how higher-level (dynamic) capabilities emerge from ordinary capabilities and organizational routines rooted in individuals' intentional behaviors (Vogel & Guttel, 2013).

Thus far, the discussion around the microfoundations of DCs poses a challenge to its utility due to the wide range of taxonomy of its origins. Furthermore, the conceptualization of the capabilities and determining the number of levels of capabilities have also been divergent (Zollo and Winter, 2002; Winter, 2003; Ambrosini and Bowman, 2009). Table 1 outlines the progression of the literature investigating the provenance of DCs in organizations. The authors' contributions are essential because exploring the underlying components of dynamic capabilities can explain the performance heterogeneity of firms. From decoupling dynamic capabilities from VRIN resources (Barney, 1991; Teece and Pisano, 1994; Teece, 1997), the authors identified them as a higher-level capability built from operational capabilities (Winter and Zollo, 2002). Others have expanded the research by investigating multiple actors that contribute to building capabilities such as top management teams (Adner & Helfat, 2003; Helfat & Peteraf, 2015), business unit managers (Martin, 2010), and non-managerial employees (Bendig *et al.*, 2017; Bojesson & Fundin, 2020; Sousa-Zomer *et al.,* 2020). Consequently, scholars have bridged the gap between the individual and organizational level investigation of DCs through routines and capabilities (Salvato & Rerup, 2011; Felin *et al.*, 2012). Scholars develop the authors' notion by relating individual competencies (knowledge, skills, and abilities) to create group-level recurrent patterns that shape organizational routines. Routines are "complex and analytic processes that extensively rely on existing knowledge, linear execution, and repetition to produce predictable outcomes at different organizational levels" (Martin & Eisenhardt, 2000). Over time, these routines become a larger scale unit to become organizational capabilities, consciously developed and deployed to enable firms to reliably perform their services or deliver their products (Salvato & Rerup, 2011). These standard operational capabilities serve as the foundation for higher-level constructs of dynamic capabilities that allow firms to adapt these lower-level entities to dynamic environments (Teece, 2007). For my thesis, I use the microfoundations concepts closely related to individuals with unique knowledge, abilities, and skills and their collective action in routines that evolve in organizational capabilities (Salvato & Rerup, 2011; Felin *et al.,* 2012).

Learning Mechanisms and Dynamic Capabilities

DCs are learned and stable patterns of collective activity through which the organization systematically generates and modifies its operating routines to pursue improved effectiveness (Zollo & Winter, 2002). The definition highlights that they are structured and persistent, which means they come from organizational processes that explain a causal link between an activity and a performance outcome (Winter, 2003). Furthermore, the structure and persistence of the capabilities come from routines, as previously mentioned. For example, a merger or acquisition activity changes an organization that triggers it to adapt its operating patterns to realize improved effectiveness from additional resources. As a result, modifications to operations are necessary post-acquisition for both the acquired and acquiring unit. Learning must arise to modify an organization's current processes to build dynamic capabilities (Helfat *et al.,* 2007; Teece, 2007).

Zollo and Winter proposed that the co-evolution of three learning mechanisms creates dynamic capabilities. They are known as tacit experience accumulation, explicit knowledge articulation, and codification activities (2002). First, experience accumulation results from organizational routines. The authors typified two routines: operational and search routines. Operational routines are known procedures routinely executed, while search routines focus on enhancing firm performance for future profits. Emphasizing search routines creates dynamic capabilities for two reasons. First, search routines track environmental changes such as technological, regulatory, and competitive conditions. Second, if a change is unpredictable, then firms must execute search routines to update dynamic capabilities. Updating dynamic capabilities prevents core rigidities, or the overreliance on once advantages that are becoming obsolete (Teece *et al.,* 1997; Teece, 2007). Search routines highlight that experience accumulation creates tacit knowledge (Winter, 2003).

The second learning mechanism identified to create dynamic capabilities is knowledge articulation. Since knowledge can be tacit while dynamic capabilities result from systematic learning, other learning processes must also exist beyond experience accumulation (Jensen *et al.,* 2007; Newell *et al., 2011*). Knowledge articulation entails the process through which actors share implicit knowledge through debriefing sessions, collective discussions, and performance evaluation processes (Zollo and Winter, 2002). In this activity, individuals can share personal experiences and compare them with others to improve their collective understanding of achieving an organizational goal. In contrast to experience accumulation, knowledge articulation has elements of collaboration and knowledge transfer. In this process, a conversion between tacit and explicit knowledge occurs (Newell *et al.*, 2010). Achieving this knowledge conversion requires individuals' effort and commitment to improving understanding of new action-performance links resulting from search routines.

Finally, knowledge codification is a recorded understanding of the performance implications of internal routines in written tools, such as manuals, blueprints, spreadsheets, decision support systems, project management software, etc. (Zollo & Winter, 2002). Knowledge articulation precedes it, and it takes more cognitive effort. Meaning, an actor must articulate knowledge before it is codified, while it is not true the other way around. It is a step beyond articulation, which requires even more cognitive effort. This activity produces an artifact from which individuals expose logical steps to arguments, define assumptions, and make causal links explicit (Zollo &Winter, 2002). Codification can further enhance the diffusion of knowledge across many individuals within the organization seeking to create dynamic capabilities.

Author	Category	Type	Contribution
Sousa-Zomer et. al 2020	DC Microfoundation (Multilevel)	Empirical	The authors deconstruct the Digital Transforming capability into its microfoundations: digital savviness, digital intensity, and conditions for action and interaction.
Bojesson and Fundin 2020	DC Microfoundation (Organizational)	Empirical	The authors study the antecedents, enablers, and barriers underpinning DC in the firm's transformation phase.
Warner and Wäger 2019	DC Microfoundation (Organizational)	Empirical	The authors construct DCs for digital transformation as Digital Sensing, Digital Seizing, and Digital Transforming and show their underlying microfoundations.
Karimi & Walter 2015	DC Microfoundation (Multilevel)	Empirical	The authors claim that underlying RPV (Resources, Processes, and Values) are modified to create DCs to respond to digital disruption.
Felin et. al 2012	DC Microfoundation (Multilevel)	Theoretical	The authors base the creation of routines and organizational capabilities based on individuals, their processes and interaction, and organizational structure.
Salvato & Rerup 2011	DC Microfoundation (Multilevel)	Theoretical	The authors provide a mapping of how individual competencies (knowledge, skills, and abilities) evolve into group routines, which then in turn create operational capabilities and eventually DCs.
Rothaermel & Hess 2007	DC Microfoundation (Multilevel)	Empirical	The authors trace the individual-, firm-, and network-level antecedents of DC and posit that multiple levels of DC factors are interchangeable rather than building upon each other.
Teece 2007 Helfat et. al 2007	DC Microfoundation (Organizational)	Theoretical	The author disaggregated DCs into the capacity (a) to sense and shape opportunities and threats, (b) to seize opportunities, and (c) to maintain competitiveness through enhancing, combining, protecting, and, when necessary, reconfiguring the business enterprise's intangible and tangible assets.
Winter and Zollo 2002	DC Microfoundation (Organizational)	Theoretical	The authors attribute DC creation to the evolution of stable, learning patterns of operational routines through tacit experience accumulation, knowledge articulation, and codification.
Bendig et. al 2017	DC Microfoundation (Individual)	Empirical	The authors extend the microfoundations of DC research by claiming that individual traits like organizational citizenship behavior and communication underpin DCs.
Helfat and Peteraf 2015	DC Microfoundation (Individual)	Empirical	The authors extend the DMC theory of how individuals contribute to DC creation through the cognition of individuals in the Sensing, Seizing, and Transforming activities of the firm.
Helfat and Adner 2003	DC Microfoundation (Individual)	Empirical	Introduces the concept of Dynamic Managerial Capabilities (DMC) that states heterogeneous management decisions lead to different performance outcomes in firms. The study also looked at how individual attributes such as social capital, human capital, and cognition contribute to DC creation.
Martin and Eisenhardt 2000	DC Foundation	Theoretical	Argues that DCs are specific and identifiable firm processes that are similar across industries and firms, i.e. best practices that are idiosyncratic in their details but exhibit common features.
Teece et. al 1997	DC Foundation	Theoretical	Defines DC's & their characteristics as: ● an ability to ● integrate, build and reconfigure external and internal competences in ● rapidly changing environments that are ● built rather than bought which ● similar to RBV and are heterogeneous among firms that ● directly affect the firm's competitive performance
Teece 1994	DC Foundation	Theoretical	The DCT was introduced to build on RBV to address dynamic competitive environments through non-fungible capabilities embedded in the firm that cannot be bought.
Barney 1991	DC Foundation	Theoretical	The RBV suggests that VRIN resources are a source of competitive advantage.

Table 1. Selected microfoundations of DCs literature from 1997-2020

2.5 Digital Transformation and Dynamic Capabilities Theory

After presenting the concepts of DT and DC and its microfoundations in sections 2.1, 2.2, 2.3, and 2.4, respectively, I answer the first sub-question: *How does the dynamic capability view define the digital transforming capability?*

Digital Transformation from the Dynamic Capabilities Perspective

While many authors have conceptualized the different forms of dynamic capabilities and their underlying microfoundations as seen in the previous sections, how the framework relates to high-velocity environments has been scantly investigated (Vial, 2019; Warner & Wäger, 2019). Consequently, the microfoundations perspective has been used to combine streams of digital transformation and dynamic capabilities research. DT's constantly evolving nature and consequences for firms necessitate dynamic capabilities to continually renew their resource base (Vial, 2019; Warner and Wäger, 2019; Sousa-Zomer *et al.,* 2020). DT catalyzes continuous change and disruption and questions how firms can design repeatable, ongoing mechanisms to adapt to turbulent market environments (Teece, 2014; Vial, 2019; Warner & Wäger, 2019). Furthermore, scholars relate that one of the distinguishing features of DC's is managing organizational change (Bojesson & Fundin, 2020). Despite that, examples of dynamic capabilities focusing on the transforming phase are still lacking (Bojesson & Fundin, 2020).

Though research in DT has yet to reach a consensus, research on how DCs can enable firms to participate in DT and promote strategic renewal has gained traction (Vial, 2019; Warner & Wäger, 2019; Sousa-Zomer *et al.*, 2021). Scholars have highlighted that to remain competitive in the digital age, firms require strong higher-level dynamic capabilities and firm strategies (Teece, 2014). The purpose of the research stream is to emphasize three dynamic capabilities to succeed in DT endeavors (Warner & Wäger, 2019). First, sensing and shaping opportunities require learning about new products and processes, customer needs, and the market environment (Teece, 2007). These are digital sensing capabilities that allow foresight into digitization trends needed for digital transformation strategies (Warner & Wäger, 2019). These digital sensing capabilities rely on the manager's cognitive and creative skills to appropriately learn, interpret, and create opportunities (Teece, 2007; Helfat & Peteraf, 201). Consequently, a slew of decisions from the search activities requires seizing dynamic capabilities (Teece, 2007). Seizing opportunities requires creating a business model and business boundaries, creating multiple value creation paths for the firm (Teece, 2007). Firms achieve this through seizing DC's, which entail decisions about investments on new opportunities, the architecture of how the firm performs them, building loyalty and commitment from the firm, and decision protocols (Teece, 2007). For firms aiming to become a digital enterprise, this means a close fit among its use of technologies, their ensuing change in value creation and organizational structure, along with its financial aspects (Matt *et al.*, 2015).

Finally, to execute a digital strategy, firms need to deploy the digital transforming capability (Warner & Wäger, 2019). The digital transforming capability is the focus of my thesis due to its novelty in the DT and DC literature (Sousa-Zomer et al., 2020). First, the authors debated whether sensing capabilities are actually a DC (Ambrosini & Bowman, 2009). The debate stems from one of the definitions of dynamic capabilities, which is the "capacity of an organization to purposefully create, extend or modify its resource base" (Helfat *et al.*, 2007). Scholars argue that they act more as an antecedent since sensing does not necessarily involve significant investments of resources (Teece, 2007; Ambrosini & Bowman, 2009). Second, research into absorptive

capacity also operationalizes sensing and seizing through organizational learning processes of the firm and through assimilating new knowledge to fit the firm's capabilities (Senivongse *et al.*, 2019), further weakening the first two DC's novelty. Third, DC literature has been linked to business model innovation to understand the organizational-level interactions to create and implement disruptive business models (Teece, 2018). Yet, it still lacks to elucidate the underlying mechanics of each DC. Therefore, solely investigating the digital transforming capability from the dynamic capability view may create awareness of the complexities associated with engaging in digital transformation (Warner & Wäger, 2019; Sousa-Zomer *et al.*, 2021)

2.6 Digital transforming capability and its microfoundations

Finally, I combine the subcomponents of the dynamic digital transforming capability to illustrate how these interrelate based on the DCT and DT concepts discussed thus far. Due to the novelty of this field of research, I systemically combined different management and collaboration literature to create a collectively exhaustive framework. I clustered the dimensions based on the framework put forth by Souza-Zomer and colleagues (2020) based on the microfoundations theory by Felin and colleagues (2012). As a result, the three main factors are individual, processual, and structural. I deduced their subfactors based on the process described in Section 2.1. As a result, Figure 7 illustrates the model of analysis at the end of this section. The model effectively answers how literature to date has defined the digital transforming capability through the dynamic capabilities and microfoundations perspective.

To address the open question on how to investigate sub-capabilities of the dynamic capabilities, several authors have used the microfoundations of routines and capabilities relating to digital transformation (Salvato & Rerup, 2011; Felin *et al.*, 2012; Sousa-Zomer et al., 2020). Continuing the thread of underlying components of capabilities, scholars theorized breaking them down into routines and competencies (Salvato & Rerup, 2011; Felin *et al.*, 2012). Routines manifest at the group level through repetitive analytical processes with predictable outcomes (Martin & Eisenhardt, 2000; Winter & Zollo, 2002), while competencies are individual possessions of knowledge, skills, and abilities (KSA's) (Salvato & Rerup, 2011). Thus, applying the microfoundations perspective to DT can give insight into differentiators of firms' digital transformation capabilities. Felin *et al.* (2012) proposed that firms must combine microfoundations related to people, processes, and structures to develop a dynamic capability suited for digital environments.

Thus far, it is convincing why the digital transformation capability can have individual, structural, and processual microfoundations. First, individual KSA's contribute to the creation of DCs through highlighted skills such as knowledge of top management teams (TMT) (Teece, 2007), cognition of managers to sense, seize, and transform firm resources (Helfat & Peteraf, 2015), and creativity (Teece, 2007; Somsing & Belbaly, 2017). In the context of DT, individual dimensionality is demonstrated by digital savviness by individuals across all levels of the firms to develop digital maturity (Kane, 2017; Sousa-Zomer *et al.*, 2020). Second, processual microfoundations in the reconfiguring phase focus search activities on exploiting existing technological and organizational assets and framing new problems solvable with the current knowledge base and business model (Teece, 2007; Bojesson & Fundin, 2020). Processual activities can entail creating digital ecosystems through leadership and technology-based acquisition (Teece, 2014). Finally, structural microfoundations, as previously

mentioned, manifest as: decentralized teams, collaborative behavior, and an agile structure to respond to change (Warner and Wäger, 2019, Sousa-Zomer, 2020). Structural activities can create the enabling context where knowledge transfer, ideas sharing, and expertise development can occur (Felin *et al.*, 2012). Thus, the literature to date culminates in the digital transforming capability composed of three dimensions of microfoundations (Felin *et al*., 2020): KSAs (individual dimensions), technology and ecology and conditions of interaction (process dimension), and organizational structure and culture (structure dimension) (Sousa-Zomer *et al.*, 2020).

2.6.1 The Individual Dimension of the Digital Transforming Capability

Individual Knowledge, Skills, and Attribute's contribution to DCs

Studies have demonstrated how individuals influence the creation of organizational-level dynamic capabilities (Adner and Helfat, 2003; Helfat & Peteraf, 2015; Felin *et. al,* 2012; Salvato & Rerup, 2011). Simply put, organizations can be seen as an aggregate of individuals that compose them (Felin *et. al,* 2012). Thus if organizations are composed of "individuals and groups whose preferences, information, interest, or knowledge differ" then specifying these differences, their origins, and then discussing their underlying factors which are aggregated to an organizational level requires investigation (Felin *et al., 2012*). Studies show that individuals in the organization have the capacity to steer the behavior and evolution of the organization, e.g. 'start scientists' in R&D, CEOs in top management teams, etc. (Felin *et. al,* 2012). Furthermore, Teece (2012) emphasizes that the skills and abilities needed to build DCs do not solely rest upon one individual or a group of individuals.

Dynamic Managerial Capabilities

Thus, turning to microfoundations of DCs research, authors have posited a 'corporate effect' of individuals on a firm performance called dynamic managerial capabilities (DMC) (Adner & Helfat, 2003; Helfat & Peteraf, 2015). The authors' concept demonstrates how individuals can build, integrate, and reconfigure organizational resources and competencies by their human capital, social capital, and cognition (Adner & Helfat, 2003). Human capital is an umbrella term for the aggregated knowledge of employees in an organization, while social capital describes knowledge accumulated through their interactions (Adner & Helfat, 2003; Bendig et al., 2017). These traits contribute broadly to what scholars refer to as knowledge, skills, and abilities (KSAs) (Salvato & Rerup, 2011), and others aggregate them as the firm's knowledge-based capital (Bendig et al., 2017). These intangible assets are important for their contribution to the transformation of firm resources (Helfat et al., 2007; Helfat & Peteraf, 2014; Teece, 2014). For example, managers achieve transformation through company-wide coordination and overcoming resistance to change (Teece, 2007). Performing these activities includes inducing cooperation among members of an organization that relies on cognitive skills such asPerformingognition (e.g. 'soft skills'), language, and communication (Helfat & Peteraf, 2014). Social cognition signifies having the ability to understand others' points of view, which provides an opportunity to influence or change their behavior (Helfat & Peteraf, 2014). They argue that the capacity is supported by language and communication abilities to share overarching goals and ambitions and persuade others to create alignment within the organization (Helfat & Peteraf, 2014). In the digital transformation context where constant changes and disruption exist (Warner and Wager, 2019), the DMCs are highly relevant for reconfiguration activities.

Individual Ambidexterity

Researchers attribute ambidexterity to the organization (Teece, 2007; O'Reilly and Tushman, 2007; Taylor & Helfat, 2009). Ambidextrous organizations can explore new knowledge domains while profiting from their existing ones through balancing exploration and exploitation, flexibility and efficiency, stability and change, etc. (Vogel & Guttel, 2013). The literature focuses on ambidextrous learning (Teece, 2007) through antecedents such as executive leadership, organizational design, and managerial cognition (Teece, 2007; Martin 2010; Helfat & Peteraf, 2014). However, succeeding literature has also shown that organizational ambidexterity can be focused on the granular level of the individual. Individuals exercising ambidexterity pursue both seeking novel and complementary knowledge to one's already existing skillset and then supplying that knowledge to other individuals (Schnellbächer & Heidenreich, 2020). In the author's study, knowledge offering led to more performance effects in radical innovation environments, while knowledge-seeking suited incremental innovation environments (Schnellbächer & Heidenreich, 2020). Therefore, depending on the level of innovation activity the organization pursues, the ratio of knowledge seeking and offering will vary based on different individuals (Teece, 2007).

Leadership and Intermediate Leadership

Extant literature also recognizes leadership as a managerial microfoundation for dynamic capabilities (Adner & Helfat, 2003; Martin, 2010). Scholars argue that guidance from the top of firms has a critical impact on how firms respond to change, citing it as a central element of dynamic capabilities (Adner & Helfat, 2003). Their guidance incites active involvement from stakeholders and overcoming resistance during transformation (Matt *et al.,* 2015; Vial, 2019; Bojesson & Fundin, 2020). While the role of CEO's and TMT's and their "corporate effects" on dynamic capabilities have been studied (Adner & Helfat, 2003; Martin, 2011), middle management have been cited as having a significant role in influencing the technological transition of firms (Taylor & Helfat, 2009). TMT's can affect the organization's technological evolution through middle management's "organizational linkages." Taylor and Helfat describe the concept as connecting actors in different roles and responsibilities within and across the firm to communicate and coordinate information to align decisions (2009). Another designation for these highly connected individuals is "boundary spanners," which allow them to broker knowledge across different levels of the organization (Newell *et al.,* 2010). They contribute to building dynamic capabilities because, under highly uncertain technological transition, TMT's might not know precisely the specific activities that would work best and how to implement them (Taylor & Helfat, 2009). However, TMTs can influence middle management through economic (salary and bonuses) and non-economic (corporate structure and technological choice) incentives (Taylor & Helfat, 2009). Effectively, this creates a concurrent "follower" and "leader" role for middle managers, which can be referred to as "intermediate leadership" (Jaser, 2018). The term refers to the duality needed for role switching between following and leading that creates both sense giving and sensemaking in leaders and followers. The middle manager must act upon the top management's vision and directives as a follower while helping their direct reports operationalize and execute the vision through their guidance as a leader (Jaser, 2018). Thus, the leadership subcomponent of the individual dimension exhibits multi-level microfoundations for digital transforming dynamic capability.

Digital Maturity

Besides DCT literature, digital transformation literature also recognizes the role individuals, namely top management, play in promoting, engaging in, and executing DT (Kane et al., 2016). According to scholars, digital leaders need essential skills like digital competence and transformational leadership to drive DT initiatives (Kane et al., 2016). For example, Chief Digital Officers (CDO's) assume different roles such as a digital evangelist, a coordinator, an innovator, and an advocate in the transforming organization (Haffke et al., 2016). They require skills to persuade buy-in and onboard digital talent in the organizations as evangelists, orchestrate several digitization initiatives as coordinators, foster risk-taking culture as innovators, and cultivate a "digital mindset" into both IT and business functions as advocates (Haffke et al., 2016). From the view of dynamic managerial capabilities (DMC), researchers can align these roles to different transformation microfoundations of DMCs rooted in cognitive capabilities such as perception and attention, problem-solving, and reasoning (Helfat & Peteraf, 2014). By doing so, it explains the heterogeneity of firm-level DC's and firm performance. Indeed, empirical analysis by Warner and Wäger revealed in two different organizations that although the job description of senior managers matched, the ways that those managers perceived and performed their tasks were completely different (2019). They illustrate how individuals' cognitive capabilities create differences in how digital transformation unfolds.

Not only do TMTs impact DT but also the digital workforce at large, known as the firm's 'digital maturity (Kane et al., 2016). Kane and colleagues identified the concept through an industry study as having digitally-oriented leadership and digital talent in the workforce (2017). Compared to the digital maturity characteristics of the leadership team, the workforce mainly focuses on domain expertise and functional knowledge, e.g., AI, cloud computing, big data, etc., technologies (Sousa-Zomer et al., 2020). Moreover, Warner and Wäger identify that onboarding' digital natives, people who have been surrounded by computers and the Internet since an early age, is necessary to execute a digital transformation strategy (2019). In the same vein, employee mobility affects organizations as employees are the foundation of their knowledge base, suggesting employee exit and entrance impact organizational capabilities (Felin et al., 2012). The organization's knowledge assets consist of the personal possession of the individuals that make up the organization (Newell et al., 2011; Senivongse et al., 2019). Other scholars recognize digital maturity as a result of digital savviness or the digital skills of the leadership and workforce of the organization (Sousa-Zomer et al., 2020). Therefore, digital savviness is considered a subcategory of the individual dimension of the digital transforming capability stratified by the workforce, directors, and chief officers due to the different activities entailing each role to achieve digital maturity (Sousa-zomer et al., 2020).

2.6.2 The Processual Dimension of the Digital Transforming Capability

While the individual dimension focuses on personal traits, the processual dimension consists of the collective's interactions to build the firm's technological ecosystem (Felin *et al., 2012*). The two sub-dimensions of process interaction and technology development are then further split into their microfoundations. Adapted to the digital transformation environment, Sousa-Zomer and colleagues mean the digital intensity of the firm, broken down to its technology acquisitions, external partnerships, and digital investments (2020). It concerns the artifacts that individuals in the firm work on and with to influence its routines and capabilities. Digital technologies are highly relevant to the process concept since their successful implementation critically

depends on the learning processes of the team (Teece, 2007; Felin *et al., 2012*). Furthermore, the learning process hinges heavily on historical and contextual factors of the firm, hence the coordination and integration sub-dimension (Ambrosini & Bowman, 2009; Martin & Eisenhardt, 2000). Teece refers to the phenomenon as path dependency, which are organizational processes, systems, and structures firms have created in the past to manage their business (2007). Thus, the implementation of new technologies influences the change of operating routines and capabilities of the firm. In turn, its implementation is influenced by already existing processes.

For the purpose of digital transforming capability, the intent behind digital intensity is to build a digital ecosystem to acquire knowledge (Sousa-Zomer *et al.,* 2020). Thus, the following subsections will discuss the two sub-dimensions of digital intensity. The first sub-dimension focuses on the process of building and acquiring digital artifacts during the firm's transformation. The second sub-dimension focuses on the methods of coordination and integration, heavily based on learning mechanisms and collaboration. This section of the literature review offers a novel way to conceptualize how collaboration and strategic management literature intertwine.

Digital Investment

Investments are almost always required for organizations to develop and commercialize new products, processes, or services (Helfat et al., 2007; Teece, 2007). These investments include large, and in some cases, irreversible strategic investments in both tangible and intangible assets (Ambrosini & Bowman, 2009; Teece, 2012). Top management commitment of substantial funds is necessary, even under complex and uncertain terms (Helfat and Peteraf, 2015). Teece highlights that the firm's growth and profitability rest upon selecting technology and product attributes, recalibrating the business model, and committing finance resources (2007). During the transformation phase, reconfiguring the resource base may focus on exploiting the current knowledge base and established technology to match the existing technological and organizational assets (Teece, 2007). Helfat and colleagues refer to this as the 'evolutionary fit,' which enables the reconfiguration activities to survive, grow, and prosper in the marketplace (2007). Evolutionary fit suggests that dynamic capabilities are path-dependent and context-dependent due to the external environment, which includes market demand, competition, and technical fitness (Helfat *et al.,* 2007).

Technology Acquisition

Research has remarked that acquisitions can enhance the company's knowledge base which in turn improves their likelihood for potential recombination. Furthermore, acquisitions of knowledge complementarities enable strategic transformation (Sousa-Zomer et al., 2020). The acquisition process contributes to the technology ecosystem creation to improve the firm's digital intensity (Sousa-Zomer et al., 2020). The ecosystem is further enhanced through improving IT/business relationships within the firm, they improve transformation intensity by investing in technology-based initiatives, implementing the technology, and increasing knowledge complementarities (Warner & Wager, 2019). Technology acquisition benefits from this because it is driven by business value rather than technology (Hess *et al.,* 2016) This means that by investing in creating a digital ecosystem, firms gain more knowledge on digital topics, transform their current assets from external sources, and improve their digital intensity to sustain digital transformation initiatives over time (Sousa-Zomer *et al., 2020*). According to literature, acquisitions and digital investments entail asset realignment and revamping routines (Teece, 2007). In addition, Adner and

Peteraf (2003) suggest that transfer of nontradable assets such as capabilities can be achieved through sharing capabilities between the new acquisition and the old firm, which is a challenge. Orchestrating the (re)configuration of its digital ecosystem requires both internal and external capabilities (Ambrosini & Bowman, 2009). In contrast, other researchers state that dynamic capabilities such as acquisition are developed solely internally for the firm (Helfat *et al.,* 2007). As mentioned in the digital transformation section, digital technologies fuel the creation of value paths for the firm which requires digital investment and technological acquisitions.

External Partnerships

External partnerships are the microfoundation closely related to coordination to integration within the digital intensity dimension of the digital transforming dynamic capability. Warner and Wager (2019 propose that traditional firms need to build or join digital ecosystems to work with new partners on co-creating opportunities and strategically renew the business; in other words, they need to navigate through innovation ecosystems. The importance of driving relationships with external partnerships can be demonstrated External through the concept of co-development (Chesbrough & Schwartz, 2007). Interactions with stakeholders such as customers can support the firm's activities to reconfigure its resource base during its transformation, changing the fundamentals of its business model and value creation paths. Support from stakeholders can breathe life into new digital products and services, such as working with customers, suppliers, governments, industry platforms, research institutions, and even competitors. For example, while Nike works as a direct-to-consumer (DTC) brand, it also works with its wholesalers such as Foot Locker and online platforms such as Zalando (Fernandez, 2020). The importance of a networked approach to digital transformation can yield cooperation, information sharing, and valuable long-term relationships (Chesbrough, 2007; Newell *et al.,* 2011).

Proximity

As established in "2.4 Learning Mechanisms and Dynamic Capabilities", learning is foundational to creating dynamic capabilities. Collaborations are essential for knowledge transfer and learning, facilitated by proximity (Cunningham & Werker, 2011). Proximity is the concept of shared dimensions among actors and their degree of closeness (Huber, 2012). Beyond the typical geographical dimension of proximity, different types exist in the literature (Boschma, 2005). In addition to geographical proximity, this thesis explores how cognitive, organizational, social, and personal proximity can facilitate the creation of dynamic capabilities. First, cognitive proximity refers to knowledge areas of expertise and experience, with the ability to communicate, understand and process information. This proximity includes the technology that mitigates collaboration and shared knowledge bases (Werker *et al.*, 2016; Cunningham & Werker, 2011). Organizational proximity focuses on the similarity within its objectives, such as its incentive structure, organizational structure, and work culture (Boschma, 2005). Another proximity is social, in which actors share a relationship at a micro-level (Boschma, 2005). Huber equated this to the concept of actors' strength of ties and further defined it as knowing each other, emotional closeness, and feeling of personal obligation (2012). Finally, the last proximity under recent investigation is personal proximity, defined as the likeness of personal character traits, behavior, and enjoyment of each other's interaction (Werker *et al.*, 2016). These proximities give insight into how partners form a collaboration, how they work together, and their productivity. From these proximities, it is clear how it relates to the process

dimension of dynamic capabilities. It facilitates the learning mechanisms among individuals needed to build capabilities through interaction and routinization (Winter 2003; Winter & Zomer, 2003).

Proximity is also crucial to build dynamic capabilities because collaborative processes contribute to routines through individual intervention and interaction (Felin et al., 2012). Proximity and collaboration highlight that the learning processes and routines need stable mechanisms for organizations to build ordinary and dynamic capabilities (Zollo & Winter, 2002). As such, cognitive proximity supports the creation of dynamic capabilities through similar technical language among members of the organization to engage in knowledge sharing, articulation, and codification which are necessary to create a shared understanding within digital transformation. Additionally, social proximity supports dynamic capabilities by increasing the organization's trust, commitment, and effort to engage in knowledge sharing, articulation, and codification during digital transformation. Moreover, personal proximity supports the creation of dynamic capabilities through enjoying each other's company and willingness to work together among members during digital initiatives. It can also hamper dynamic capabilities due to the lack of enjoying each other's company and decreased desire to work together. Finally, geographical proximity supports the creation of dynamic capabilities because of the importance of face-to-face interaction among employees to engage in knowledge sharing, articulation, and codification during transformation processes. According to Felin and colleagues, understanding the dynamics of routines and learning start from individuals as the drivers of knowledge accumulation on higher organizational levels (2012), and proximity allows the examination of collaboration formation in building dynamic capabilities.

2.6.3 The Structural Dimension of the Digital Transforming Capability

Conditions of action and interaction, i.e., structure and culture, refer to how firms create the conditions where digital transformation is most conducive (Sousa-Zomer *et al.,* 2020). The premise of the investigation within this dimension investigates enabling factors for faster information processing in the organization, outlining choice constraints, and ultimately, effectively managing decision-making (Teece, 2007). Several authors have attributed a nimble and agile organizational structure to enable the workforce to respond to customer demand quickly and collaboratively (Felin *et al., 2012;* Bojesson & Fundin, 2020; Sousa-Zomer *et al.*, 2020). The trademarks of an agile company include teams with a people-centered culture operating in rapid learning and fast decision cycles, enabled by technology and a common purpose to co-create value for all stakeholders (Teece, 2007). Furthermore, previous research discovered that functional and departmental silos are a source of hindrance to a company's success in the digital age, and these silos are associated with negative performance (Taylor & Helfat, 2009). On the contrary, multi-divisional firms efficiently innovate because they decentralize product or service development and decision-making by assigning them to the relevant divisions (Teece, 2007).

Researchers have attributed internal structure and design reconfiguration to facilitate better decision-making processes (Teece, 2007; Warner & Wäger, 2019). Helfat and Peteraf have attributed heterogeneous cognitive abilities to different decision-making paths that lead to firm performance variance (2014). Teece (2007) cautions that unbiased, high-quality decisions about often irreversible investments are as rare because decision-making errors and biases are ubiquitous. Therefore, having multi-divisional structures in the firm prevents new ventures from being starved of financial resources due to decentralized decision-making processes. According to Teece, multiple layers of standard procedures and established capabilities can

discriminate against innovation decisions (2007). Furthermore, decentralization allows power redistribution needed for traditional firms to navigate new partnerships and co-create in digital ecosystems (Warner & Wäger, 2019). Beyond investment changes, operational changes included restructuring existing departments, tasks, leadership roles, and enabling new digital departments. The reconfiguration helps organizations pivot from working in traditional silos to transparent and open ways of working (Schneckenberg *et al.*, 2015).

Agile

An agile organization can effectively and efficiently redirect resources to capture the value and protect it within the constraints of its internal resources and external environment (Teece *et al.*, 2016). One method often employed is the agile methodology, which transcended IT departments to digital departments, using product owners, proof of concepts, minimum viable products, and scrum to increase digital offerings (Rigby *et al.,* 2016). The methodology improves development through iteration, customer feedback, and favoring value over feature offerings through minimum viable products (Szalvay, 2004). Furthermore, methodologies such as “lean startup” and “build-measure-learn” favors experimentation, incremental iteration, and learning over elaborate planning so that digital teams offer new products and services (Teece *et al.,* 2016). However, becoming agile for firms is a challenge in itself. The authors also noted that agile enterprises need broad and sweeping changes to become agile enterprises (Hess *et al., 2016*). Furthermore, Teece and colleagues cite stubbornness, entrenched interests, and misgivings about the need for transformation hinder firms from becoming more agile (2016). On the contrary, they also note that agility creates trade-offs with efficiency since operating in an agile manner comes with uncertainty generated by innovation and dynamic competition (2016).

Decentralized Divisions

Decentralization is the degree to which firms push down decision-making to lower levels of the firm (Schilling et al., 2010). The idea behind decentralization is to allow divisions of large firms to create products and services that closely cater to their particular customer needs (Teece, 2007; Schilling et al., 2010). It allows managers flexibility in decision structures to become closer to newer technologies, customers, and markets (Teece, 2007; Warner & Wager, 2019; Sousa-Zomer et al., 2020). Literature has shown that functional and departmental silos correlate to negative performance (Sousa-Zomer et al., 2020). Poor performance effects stem from the lack of efficiency in decision-making, which multi-division firms have due to the decentralized nature and faster information processing (Teece, 2007). The efficiency in overcoming barriers to make decisions allows companies more opportunities for digital transformation (Warner &Wager, 2019). Martin also echoes this notion that it is more optimal to intertwine the strategy formulation at the corporate level and strategy implementation at the business unit level in highly dynamic markets (2010).

Risk Taking Cultures

Sousa-Zomer and colleagues note that risk-taking and entrepreneurial action allows more knowledge creation, a critical factor in digital transformation (2020). Thus a rich risk-taking culture enables an environment where employees can perceive more opportunities in highly uncertain innovation processes (Teece, 2007). Schenekenberg and colleagues believe that rewarding employees for risk-taking behaviors foster more innovation (Schnekenberg *et al.*, 2015), especially in an uncertain environment of digital disruption (Karimi and Walter, 2015). As Teece and colleagues assert, dynamic capabilities require decision-making that toggles between risk to uncertainty (2016). As managers make decisions that differ from routine operations, which is needed to create higher-level dynamic capabilities, more risk-taking is required (Somsing and Belbaly, 2017). Sousa-Zomer and colleagues also conflate agile enterprises as risk-taking since they must constantly reconfigure the firm in dynamic digital environments (2020). However, while experimentation can lead to new insights, it can also lead to failures. Thus, it is also vital the culture rewards risk-taking and creates an environment where employees feel free to express views and constructively confront each other to create collective learning (Fainshmidt & Frazier, 2017).

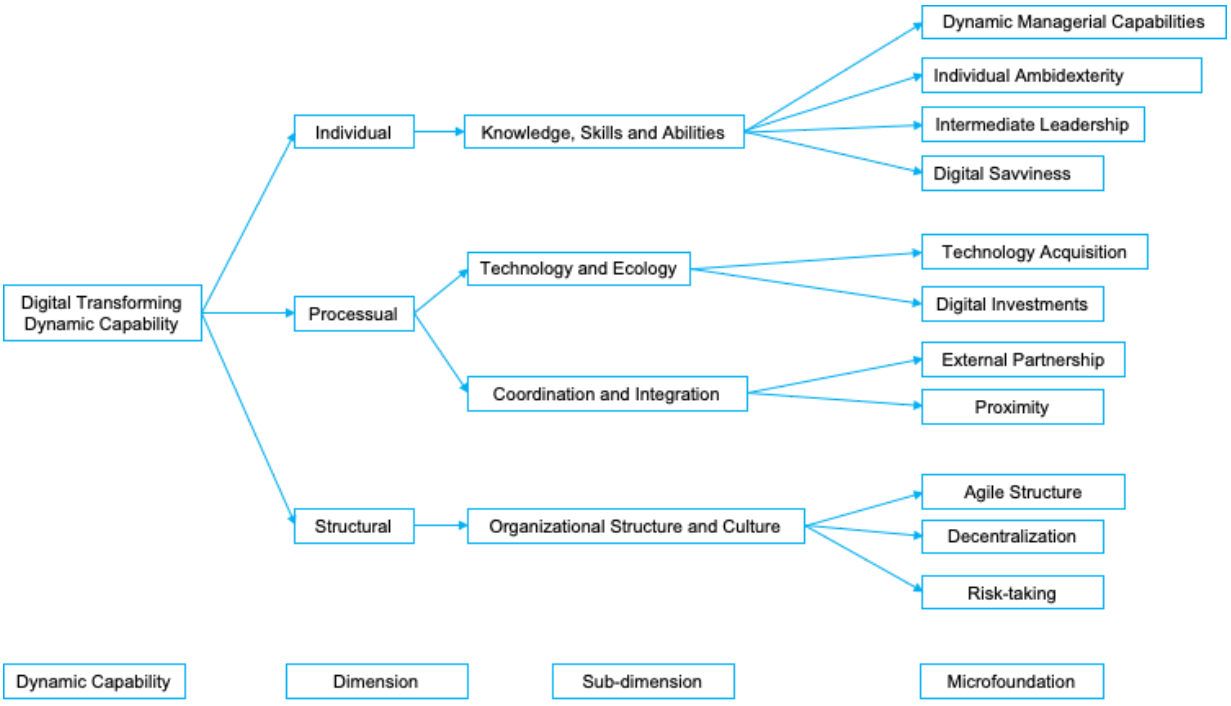


Fig. 7 Synthesis of the model of Digital Transforming Dynamic Capability

2.7 Knowledge Gaps

At the beginning of my thesis, I have shown the imperative task of managers and organizations in the fashion industry to digitalize. Digitalization of their firms enables new paths of value creation such as marketing channels and customer engagement, which can improve brand equity and the firm's performance in multiple ways. However, this journey presents challenges to companies in building these capabilities in an ever-changing digital landscape. I dive into this source of the ever-changing process of digital transformation in the literature review. I demonstrated how digital transformation evolved from

another long-standing phenomenon, ITOT, to extend technology's transformative potential beyond the organization to society at large. Finally, I arrived at the DCT for digital transformation and its microfoundations to expand how a firm can build a "dynamic digital transforming capability."

My extensive literature review revealed a disparity between individual and organizational capability building, and there is no clear link. As previously mentioned, a multi-level perspective is needed to understand how organizational dynamic capabilities evolve from individual KSAs and group routines. Thus, the model presented in Figure 7 shows that there is a structural, processual, and individual dimension in building the dynamic digital transforming capability. I offer critical insight into how companies in the same industry with similar resources have different capabilities, as the microfoundations perspective disaggregates organizational capabilities into its subcomponents. Literature has been forthcoming to highlight a need to further understand how individuals and routines contribute to the evolution of ordinary capabilities into dynamic capabilities.

The literature presented two frameworks: a general dynamic capabilities framework for digital transformation (Warner and Wäger, 2019), and then it was further expanded to focus on the transformation phase using the microfoundations perspective (Souza-Zomer *et al.,* 2020). Thus far, the literature is divergent, and no consensus exists on how dynamic capabilities are built, especially in the digital transformation context. However, as my extensive literature review revealed, more facets to the three dimensions were presented, especially the individual and structural dimensions. Thus, I used this model of reference to possibly uncover other subcomponents of the dynamic capability in the context of digital transformation in the retail industry.

Chapter 3 Research Design

I introduce this section with the research formulation to answer the third research sub-question, "*what are the building blocks of the digital transforming capability in the retail industry*?". In the first section, I outline its nature and scope. Then, the subsequent research questions elaborate on the result of the knowledge gaps during the literature review in the previous section. Next, I identify and motivate my chosen research methods. Finally, I reflect on the relevance of my research to the Management of Technology program.

3.1 Research Questions

A review of the extant literature in the previous section reveals a gap between the knowledge of executing digital strategy through digital transformation, known as the digital transformation capability, and its microfoundations to reveal its underlying mechanisms. There is a synergy between the ever-changing nature of digital transformation and the ability of dynamic capability theory to respond to dynamic change. Therefore, more empirical evidence using the DC theory as a basis is needed following these research streams. Consequently, my thesis addresses the research question:

> ***How do organizations in the apparel and fashion industry build dynamic capabilities to execute their digital transformation strategy?***

To answer this main research question, it is prudent to trace the construct's origins from digital transformation, dynamic capabilities, and microfoundations of dynamic capabilities fields of research. Following the evolution of the constructs illustrates its building blocks, and my thesis extends it to the low-tech industry of retail. I achieve this through answering the sub-research questions that follow:

1. *How does the dynamic capability view define the digital transforming capability?*

Answering this sub-research question results in the discussion of how adjacent fields of research digital transformation and dynamic capabilities are combined to give guidance on successful digitalization initiatives. As previously mentioned, endeavors in this have had low success.

2. *What are the building blocks of digital transforming capability according to extant literature?*

Once the digital transforming capability is defined, I reference the microfoundations of the dynamic capabilities perspective to describe how firms build it. Answering this question also provides an overview of the research of decomposing a dynamic capability as a firm construct into an ordinary capability, group routines, and finally, individual KSA (knowledge, skills, and abilities).

3. *How do individuals and routines contribute to building operational capabilities that evolve into dynamic capabilities?*

Answering these research questions offers the following theoretical contributions:

1. Explore the micro-level foundations to build the capability to execute a digital transformation strategy and reconfigure their resource base to adapt to the digital age.
2. Provide empirical evidence of how incumbent firms in traditional industries build the digital transforming capability.
3. Compare microfoundation of the digital transforming capability of traditional industry incumbent firms to those of high-tech industry incumbent firms in literature.
4. Disaggregate the high-level construct of dynamic capabilities and their antecedents.
5. Investigate how practitioners can disaggregate firm-level capabilities into their underlying routines

3.2 Research Scope

The scope of my research is the firm's individual, process, and structural dimensions to have the necessary components to develop the digital transforming capability. These dimensions are explored from a microfoundation perspective and illuminate the possible sources of heterogeneity of firm performance. Understanding the interplay of these three dimensions can give insights into the enablers and challenges in building successful digital transforming capability. The literature review culminated in the framework put forth by Sousa-Zomer *et al.* (2020). The literature review conducted in the previous chapter culminates in a model of the digital transforming capability. Thus, the main purpose of my research is to determine what microfoundations are necessary to build the dynamic capability to engage in and sustain digital transformation initiatives. The existing literature has offered ways to investigate this via the dynamic capability view and the microfoundations perspective. I build on these findings to trace the origins and explain these constructs in practice, to provide context on how these constructs in practice can unfold. Doing so can also reveal the enablers and challenges that managers may face while building this dynamic capability for their firm. Therefore, my thesis takes the exploratory perspective. I will adopt a qualitative research approach to answer the third research question by collecting and analyzing existing data and applying the model in practice.

Extant literature has emphasized that digital transformation is not solely adopting cutting-edge technologies. Instead, firms can engage in an increasingly digital environment and sustain it over time (Kane, 2017). Therefore, using a qualitative approach is appropriate because of its flexibility to investigate how this capability is built-in for firms. Consequently, any new insights gained from this approach will be inductive. As a result, I present a nuanced understanding of a complex phenomenon (Saunders *et al.*, 2016).

3.3 Research Philosophy

Philosophical positions concerning research design can ensure quality in management research (Saunders *et al.,* 2009). Therefore, it is significant to mention my reflexive role in my thesis. This position helps clarify collecting, analyzing, and interpreting empirical data and distinguishing between appropriate and unsuitable research designs (Saunders *et al.,* 2009). Furthermore, it elucidates my ontological and epistemological stances (Saunders *et al.,* 2009). In short, ontology refers to the researcher's view on the nature of reality, while epistemology concerns the researcher's notion of knowledge and the acceptable and valid way it is communicated (Saunders *et al.,* 2009). On the one hand, the ontological view relevant to my research is called relativism. Relativism describes the researcher's viewpoint as having multiple subjective truths

(Easterby-Smith *et al.*, 2015). On the other hand, the epistemological stance relating to my research is social constructivism. My view aims to explore the research topic through a selected number of key people instead of sampling and statistical probability to test theories (Easterby-Smith *et al.*, 2015). The following sections illustrate why these two stances help the study explore how incumbent fashion and retail companies build the digital transforming dynamic capability. As the literature review section suggests, it is essential to disaggregate organizational-level capabilities to their underlying components to discover the elements that could explain heterogeneity among different firms.

3.4 Research Approach & Methodology

Conducting research is commonly achieved through three forms of logical reasoning: deduction, induction, and abduction (Saunders et al., 2016). Since my study aims to understand microfoundations of the digital transforming capability through an exploratory research design, I follow an abductive approach throughout the study. My study bases the data collection on existing theory to modify it and generate new ones via additional data collection (Charmaz, 2006). Alternating between data collection and theory enables the development of understanding theoretical concepts and real-life phenomena. The abductive research process model illustrated in Figure 8 references Dubois and Gadde (2002). The process starts with the gaps discovered in the problem statement of the theory to create a conceptual frame of reference. The activity resulted in a framework that exhibited digital transformation as a dynamic capability through the lens of microfoundations of dynamic capabilities as routines and individuals. Then, qualitative data provided empirical findings that resulted in modifying the initial framework. Finally, I outlined the findings and developed them into the final framework to build on the existing theory from analyzing the qualitative data.

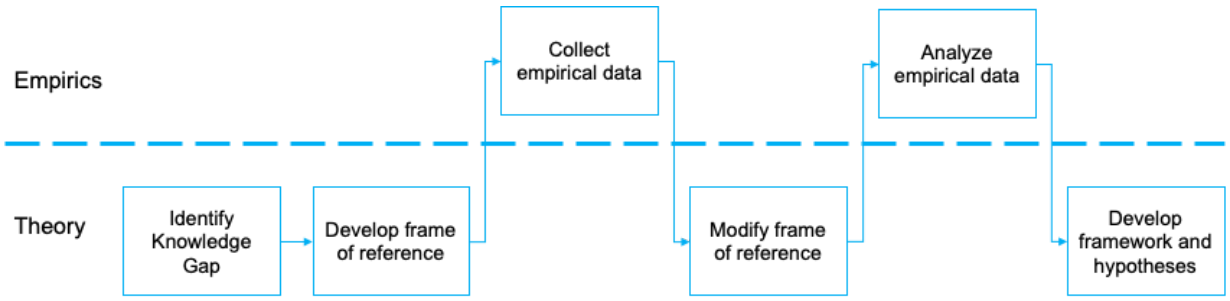


Figure 8 Abductive Research Process (Dubois and Gadde, 2002)

In line with supporting the abductive approach, I conduct an exploratory qualitative study from a relativist perspective. Since only a few studies on microfoundations of digital transforming capability exist as defined above (Warner & Wäger, 2019; Sousa-Zomer *et al., 2020*), it is worthwhile to gain a richer understanding of the phenomenon of digital transformation capability in the context of traditional industries like fashion through in-depth investigation (Saunders *et al.,* 2016). Thus, I chose an embedded multiple case study to study the mechanisms of incumbent firms' digital transformation capability (Warner & Wäger, 2019). An exploratory case study is an appropriate research strategy because of the nature of the research question relating to the phenomenon of digital transformation over which the researcher has no interference (Yin, 2018). Furthermore, the exploratory research strategy allows insights into an open question about the equifinality of dynamic capabilities

(Easterby-Smith *et al.,* 2009; Ambrosini & Bowman, 2009). While Teece challenges the idea that dynamic capabilities are irreplicable (2007), scholars argue that they exhibit commonalities albeit with idiosyncrasies in their details (Martin & Eisendhardt, 2000; Ambrosini & Bowman, 2009). Therefore, my study draws on the strength of the case study approach to gain contextualized insights where the boundary of digital transformation capability and the setting of the industry and incumbent firm are not evident (Yin, 2018).

3.5 Case Design

Choosing a research strategy depends on its aims, main research question, philosophy, and approach. As previously mentioned, the strategy selected with which to conduct the qualitative study is the case study. Yin (2018) defines the research strategy as: "*an empirical inquiry that investigates a contemporary phenomenon within its real-life context especially when the boundaries between phenomenon and context are not evident*." Furthermore, as the literature review revealed, it is difficult to show the origins of routines and capabilities without accounting for historical and contextual factors that play a role in their development (Felin *et al., 2012*). As such, my study's goal is to understand the phenomenon of the underlying microfoundations of dynamic capabilities to engage in digital transformation. The case study strategy enables a deeper understanding of the phenomenon in a real-life setting to build on unexplored areas in the literature (Eisenhardt, 1989).

Yin differentiates case study designs along two dimensions: the number of cases and units of analysis (2018). Single case studies are appropriate for five single-case rationales— namely, critical, unusual, common, revelatory, or longitudinal studies (Yin, 2018). The critical case, which my study presents, aims to specify the precise set of circumstances within which theoretical propositions are correct or whether alternative explanations may be more relevant (Yin, 2018). Furthermore, it usually provides insights on individual cases such as a company, a specific project, a group of people, or even a specific individual (Saunders *et al.*, 2016). A single case can be compelling to expand theoretical concepts through in-depth investigation (Eisenhardt, 1989). The singular case is replicated into multiple cases to exhibit a more robust analytical generalization. They contribute to greater chances of developing theories through within-case analysis and cross-case analysis. Researchers can compare the various findings from each case utilizing replication or elaboration on their discovered differences (Yin, 2018). While replication contributes to creating compelling theory development, they are often distinguished based on their outcomes. The variation is due to the versatility of organizations, as explained in Chapter 2, and the comparison of the timing and the stage of each company's digital transformation journey.

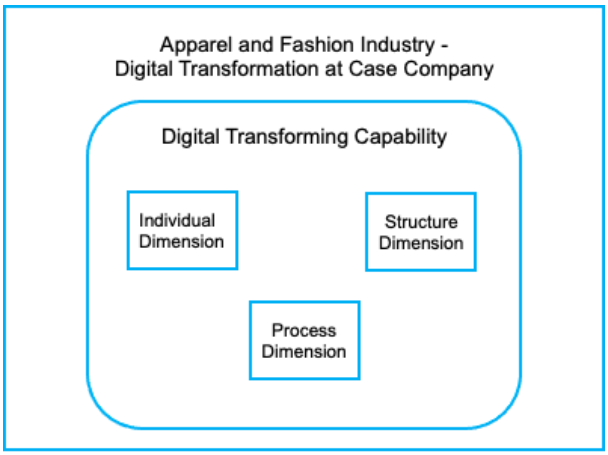


Figure 9 Embedded case study

Though the case study method has grown in popularity in management research, it is still widely challenged (Saunders *et al.m 2016;* Yin, 2018). Researchers often question its rigor due to non-standardized methods of conducting qualitative research and case studies (Yin, 2018). My research addresses that criticism through the systematic procedure adapted from Eisenhardt presented in Figure 10 below (1989). Another common critique is the level of effort could be unmanageable due to the massive narratives resulting from data collection (Yin, 2018). I put forth a scoped research question and transparent criteria for the case study selection to address this pitfall. Finally, generalizability is a likely concern (Yin, 2018). Still, a case study with embedded units of analysis can offer more insights into the concept under study (Yin, 2003). The case study is an appropriate strategy for my research project because the microfoundations of dynamic capabilities are considered idiosyncratic in the literature (Teece, 2007; Eisenhardt & Martin, 2000). The authors mean that the theorized source of heterogeneity of firms' capabilities and, therefore, performance comes from the internal mechanisms they build capabilities. My work references the framework for Digital Transforming Capability presented by Warner and Wager (2019), which Sousa-Zomer et al. (2020) expounded based on Felin *et al.* (2012) with the subunits of the analysis: individual, structure, and process dimensions.

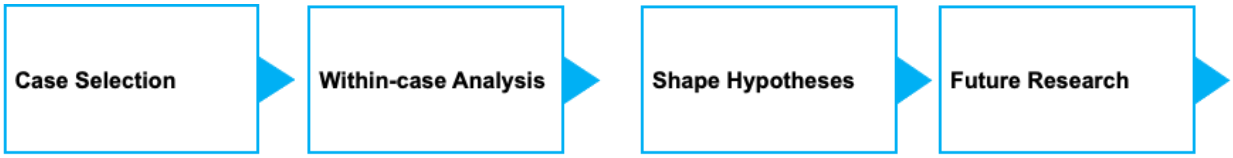


Figure 10 Exploratory Case Study Approach (Eisenhardt, 1989)

3.6 Case Selection

I conducted the cases under study on the world's largest sportswear and fashion brands undergoing massive digital transformation with regional or global HQ operations in the Netherlands. The discussed cases exemplify the incumbent problem firms in the fashion retail industry face when building capabilities to engage in digital transformation. From the dynamic capabilities perspective, this means they have digitally sensed (explored) and digitally seized (exploited) opportunities that require them to digitally transform their resource base (Warner & Wäger, 2019). I investigated The case companies' archival data to trace the firms' DT journey, such as annual reports, industry reports, and databases such as Factiva, which covers news

globally on technology investment, implementation, and performance (Zousa-Somer *et al., 2020*). The exercise revealed that incumbent firms had appointed top management technology positions, i.e., CTO/CIO/CDO, invested in or acquired digital companies, and pursued digital business models such as platform marketplaces to exhibit sensing and seizing capabilities (Teece, 2007). Ambrosini and Bowman argue that sensing and seizing are antecedents to transforming and reconfiguring dynamic capabilities. Thuslities (2009), thus the focus of the study is solely in the digital transforming phase. Furthermore, the low-tech industry they occupy experiences much digital disruption, which requires the core concept of dynamic capabilities to respond to dynamic environments (Teece, 2007). The digitalization of the fashion and retail industry is undeniable and has reached a watershed marked by the COVID-19 pandemic (BoF, 2020). The company cases represent how incumbent firms in the retail industry build the digital transforming capability through developing deeper insights on its microfoundations. The following Table 1 provides the case company overview and the respondents that participated in my study. They collectively represent over 50 years of experience in the fashion industry and 20 years experience in digital transformation initiatives. The following paragraphs describe the companies' digital initiatives used as exemplary cases for my study. Thus, the case companies and participants bring much insight into the concepts under study.

Company Code	**NRG, Inc.**	**Active, AG**	**Prep, Corp.**
Case Company Overview			
Industry Segment	Mid-market	Mid-market	Mid-market
Size (employees)	>70.000	>50.000	>40.000
Revenue/Year	€36.11B	€19.8B	€9.9B
Founded	1964	1949	1881
Firm Type	Footwear/Sportswear	Footwear/ Sportswear	Apparel/Retail
Market focus	Global	Global	Global
Scope of Case Data			
Interviews	3	1	3
Perspective	Technology Technology Technology	Management	Management Technology Technology
Experience	>5 years exp	>5 years exp	>5 years exp
Education	> MSc	> MSc	> MSc

Table 2. Case companies overview

Case Company 1: NRG, Inc.

NRG, Inc. is the no. 1 brand of footwear, apparel, and athletic equipment. It is a growth company on the frontier of product vision and customer experience excellence fueled by digital technologies. The company operates in four major markets: North America, EMEA (Europe, Middle East, and Africa), Greater China, and APLA (Asia Pacific and Latin America). Previously, it had six geographies: North America, Western Europe, Eastern/Central Europe, Greater China, Japan, and Emerging Markets (Ambos & Schlegelmilch, 2010; NRG-1, 2019). The digital transformation understudy started in mid-2017, concerning the restructuring of NRG's Western Europe, Central, and Eastern Europe, including the Middle East and South Africa (SA), and Digital Direct-To-Consumer (DTC) businesses under one EMEA organization to better respond to customer tastes (NRG-1, 2019). This strategy uses a centralized, cloud-based analytics platform that serves all data needs for the verticals' business operations, historically done in silos. Thus, a new department emerged: Enterprise Data Analytics (EDA) as the central function to coordinate the transition to cloud-based analytics solutions for the business functions. They face three key challenges. First, they aim to have a shared vision about digital transformation. Second, they need to align with the business function's goals. Finally, they are trying to extract value from every step of the digital transformation journey (NRG-1, 2019).

Case Company 2: Active, AG

Active AG is the no. 2 sportswear brand globally that focuses on activewear under two brands (Active AG, "About Us," 2021). A significant player in the footwear and apparel industry, it has major partners in its digital transformation journey, similar to the following case company. In 2014, it joined the four-brand consortium to co-innovate the Fashion Management System with SaaS/IaaS/PaaS giant SAP (Araujo, 2014). Being an archetype fashion and apparel company, it co-created the next-generation integrated business planning and analytics platform using SAP's latest technology, S4/HANA. The goal of Active AG in evolving its IBP system is to serve customers more quickly. Active AG outlined the "Speedfactory" strategy in the company's five-year plan in 2014, which was redoubled in 2017 with the introduction of the Digital Leadership Team to make the company the first "fast sports company" (Active AG, "Corporate Strategy," p. 62, 2017). Since 2017, they have invested over €200M per year to push digital transformation initiatives in e-commerce, smart manufacturing, and optimizing global operations (Active AG, "Investment Analysis," 2017, 2018, 2019). The company also collaborated with Siemens to push the Speedfactory digital end-to-end design, creation, and automation of products (Active AG, "Operational Highlights," p. 8, 2017). According to the research participant, Active AG has several digitization projects steered by the DLT to become a truly digital enterprise. The transitions to FMS for the supply chain group in the Netherlands office were centralized and diffused to all global teams (Active-1, 2021). Along with the central Digital Department, each central function transitioned into the new FMS from the previously siloed business planning and analytics platform each territory used. The transition into FMS took five years, and I studied Active-1's experience working with the digital department.

Case Company 3: Prep, Corp.

Prep, Corp. is a global fashion and lifestyle brand founded in 1881 and has been publicly traded on the New York Stock Exchange (NYSE) since 1920. It owns and wholly operates two well-known American fashion brands and several other legacy brands and licensees in over 40 countries (Prep Corp., "About Us," 2021). In 2014, one of the leading Prep brands, "TH," participated in a consortium along with Active AG to co-innovate the Fashion Management System (FMS) with SAP (Araujo,

2014). The collaboration combined two siloed operations systems: wholesale and manufacturing and retail merchandising and distribution (Prep-1, 2019). The result was a verticalized system running on the SAP platform that allowed seamless operations from sourcing to manufacturing to inventory and merchandising management offline and online. Prep, Corp. Europe implemented this system in 2014, which means a complete transformation of the sourcing and buying processes (Prep-1, 2019). Historically, the departments in Prep, Corp Europe used the previously siloed databases to run operations which meant manual handovers of data between finance, buying, sourcing, inventory, etc. After the implementation, the master data stored in the new FMS allowed a data lake that enabled one source of truth for managing the business. The transition created a challenge for the buying and sourcing department to diffuse the new FMS across the department and the territories it serves globally. Additionally, Prep, Corp. acquired a joint venture with “TH” China to capture the strategic Greater China market. The acquisition also meant that for the Prep, Corp. Europe group, the onboarding of the new buying group in the Chinese region (Prep-1, 2019).

3.7 Data Collection

3.7.1 Interviews

As the literature suggests, digital transformation is an expansive research field due to digital technologies’ generativity and ubiquity (Vial, 2019; Warner & Wager, 2019). As a result, the unit of analysis of my study is the three dimensions of microfoundations needed to build dynamic capabilities-- namely, individual, structure, and process (Felin *et al.,* 2012; Sousa-Zomer *et al.,* 2020). Through these dimensions, Researchers can investigate the concept of digital transformation capability (Yin, 2018). In line with the abductive approach, I will approach individuals from different levels of the firm directly related to digital initiatives ranging from product development, engineering, and operations for semi-structured interviews (Saunders *et al.*, 2016). Using my previous internship experience, these interviewees will be the basis of the investigation to confirm or disconfirm the results from the secondary data analysis of each company’s press coverage and archival records that relate to the scope of the study, further explained in Chapter 4. They have also added valuable insights through the open-ended nature of semi-structured interviews, which gives deeper insight into the research theme. Each interview lasted 0:35-1:15 hours over video conferencing. I recorded the interviews for digital transcription, so the focus is on the interview instead of note-taking. I summarized the results in Appendices 1 and 2. Due to confidentiality considerations, the participants are anonymous. The interviewees are presented below in Table 3

Code	Role	Responsibility	Perspective	Length
NRG-1	Director of Data Product in Analytics and Reporting - Marketplace Analytics (DSM)	Lead integrated squads to create data products for the data enablement of the planning team using cloud solutions	Director	1:10
NRG-2	Senior Manager of Data Products in Analytics and Reporting (DSM)	Build technical and analytics products for the demand, inventory, and merchandise planning organization	Manager	1:00
NRG-3	Data Scientist in Marketplace Analytics (DSM)	The end use of the data analytics products created by the product teams	Technical	1:15
Active-1	Business Process Manager, Planning and Purchasing	Main point of contact between IT and Business functions for system-related releases for purchasing and planning activities	Manager	1:00
Prep-1	Buying and Sourcing Process Development Manager	Transition the central buying and sourcing group along with the Greater China group into the new SAP FMS	Manager	:45

Prep-2	Director, Analytics and Business Intelligence (ABI)	Functional architect overseeing data product developments on the SAP platform focused on SCM . Oversee ABI investments and work on data products based on the SAP Business Warehouse (BW) and SAP HANA data platform, serving all functions	Technical	:35
Prep-3	Sr. Director, Analytics and Business Intelligence (ABI)	Functional architect overseeing data product developments on the SAP platform focused on SCM. Oversee ABI investments and work on data products based on the SAP Business Warehouse (BW) and SAP HANA data platform, serving all functions	Director	:37

Table 3 Research participants interview profile

3.7.2 Archival Data

The primary data procured via semi-structured interviews are triangulated with secondary archival data on the case companies. The documents used in the study are text material from press releases, company memos, market analysis, and Securities Exchange Commission (SEC) financial reports (K-10 forms). Furthermore, all companies operate in the United States, which requires them to file financial reportings annually on the electronic data-gathering, analysis, and retrieval system (EDGAR) platform, upon which the archival data in this thesis is used (Souza-Zomer *et al.,* 2020). Saunders and colleagues suggest that facilitating triangulation of primary and secondary data may elaborate the respondent's descriptions of the study theme and contextualize the empirical results (2016).

3.8 Data Analysis

As previously noted, the pitfall of qualitative data analysis is the sheer large amount of text data and its complexity (Saunders *et al.,* 2016; Yin, 2018). Indeed, the semi-structured interviews resulted in 60 pages of raw data after respondents consented to recording and I transcribed the audio. The data, therefore, was unstructured, unordered, and unreduced, making it difficult to analyze from the outset (Saunder *et al.,* 2016). As such, the data complexity called for data reduction. Theme identification is one way to achieve reduction, which is fundamental to qualitative research (Charmaz, 2006). Using the frame reference from Chapter 2 literature review, the themes for the interview topic guide were: general questions about the organization, individual KSAs, conditions of action and interaction, the digital intensity of the organization, and finally, enablers and barriers for collaboration. These themes emerged from the research question, purpose, and extant literature.

Therefore, the case analysis draws systematic inferences from the qualitative data, organized by the abovementioned themes. These concepts were then related to pre-existing theory and synthesized for their meanings and relationships (Saunder *et al.,* 2016). Synthesis was achieved first through open coding, where statements, sentences, or paragraphs were coded into a word or a short phrase (Saunder *et al.,* 2016). These codes may enable links among the concepts and ideas that one can systemically categorize based on their similarity. Following open coding, categorization uses the relevant text data and assigns them to a proper category (Saunder *et al.,* 2016). The process then generates themes and builds relationships between codes. Furthermore, iterating through the inductive categories out of the text ensures that the category definition and level of abstraction (and categorization) are consistent. Finally, their relationships are studied once critical categories and concepts are determined (Saunder *et al.,* 2016). These successive steps ultimately lead to answering the research question. Then, I verified conclusions with the theoretical framework that I reported from the findings.

3.9 Criteria to Interpret Research Findings and Ensure Data Quality

Yin claims that to interpret the strength of the research findings, specifying and enumerating rival explanations to the findings and addressing them reinforces the findings' value (2018). Therefore, in the same manner that the conceptual framework I derived for the study, researchers can also analyze previous studies to show rival explanations. It is also possible that after the study I conduct, rival explanations will emerge, which then becomes a basis for future study research (Yin, 2018). However, as nascent and fragile the construct of dynamic capabilities is, several papers argue many aspects of its origins and consequences (Easterby-Smith *et al.*, 2009; Helfat and Peteraf, 2013; Senivongse *et al.*, 2020). Hence, it is likely other constructs can bring a different explanation to how digital transforming capability is developed. To ensure the quality of the research, construct validity is achieved by operationalizing the concepts studied through multiple sources of evidence. External validity is reached through replication logic across multiple cases. Finally, reliability is ensured through case study protocol and maintaining a chain of evidence through memo-writing, interview transcription, and a detailed case study protocol (Yin, 2018).

3.9.1 Reliability

Reliability means the theoretical basis should be sound, independent of the selection of the research participants (Saunder *et al.*, 2016). Furthermore, replication and the ability to reproduce the research contribute to the reliability of the research (Yin, 2018). It allows other researchers to follow the steps outlined in the research methodology and arrive at the same findings. However, reliability can lack due to the open-ended nature of semi-structured interviews. Especially since the interview questions ask about the individuals' knowledge, skills, and abilities (KSAs), which come from the tacit experience that is highly personal, can contribute to its open-endedness. Additionally, knowledge resultant of tacit experience stems from doing, using, and interacting (DUI), which calls for recombinations of often informal interactions in the organization (Parilli & Heras, 2016). My thesis achieves high reliability through transparency by detailing the methods, empirics, and analysis, and case study protocol (Yin, 2018). While questions to the respondents yield different answers, they still relate to the constructs outlined in Chapter 2. Additionally, in line with the case study approach, my study contains case study notes, direct quotes from the research participants, and referenced archival records in the following chapter.

3.9.2 Validity

3.9.2.1 Construct Validity thesis

Construct validity requires a chain of evidence and triangulation (Yin, 2018). The former allows transparency in how authors move from research inquiry to conclusions. The latter increases the quality of the constructs by using different sources of information that point to the same conclusions. Concerning the chain of evidence, extensive literature review in digital transformation as a source of constant change for the firm sets the research in context. Then, an exhaustive critical literature review on the dynamic capabilities theory and its microfoundations furnishes the frame of reference for the empirical investigation on how these mechanisms contribute to building the dynamic digital transforming capability. The outlined knowledge gaps and the research questions guide the data collection to induce insightful answers from the participants.

Triangulation also helps contextualize the research respondents' answers to company filings, news, and market coverage. At least one participant from each case study company presents a holistic representation of the constructs under study.

3.9.2.2 Internal Validity

Internal validity refers to the logic of the inferences from the case studies explored, ensuring their plausibility (Yin, 2018). First, it connects to the logical construction of the frame of reference presented in Chapter 2. It serves as the basis of analysis for the subsequent empirical investigations. Abiding by guidelines presented by Yin, the theoretical frame of reference sources at least three scientific literature to triangulate the microfoundation constructs of the dynamic digital transforming capability specified in Chapter 2.5. In addition, using pattern matching, the comparison of empirical observations and previous studies increases internal validity. The technique is vital in the analysis chapter. First, it allows matching observations from the empirical findings in Chapter 4 and those derived from the frame of reference in Chapter 2. Furthermore, three embedded case studies were carried out and compared to discover similar patterns among the cases. It can ensure that the findings are based on solid evidence (Saunders *et al.,* 2016).

3.9.2.2 External Validity

Addressing external validity means making the study as generalizable as possible (Yin, 2018). Specifically, analytical generalization is relevant to qualitative studies such as case studies. It is derived from the empirical observation to support theory rather than statistical generalization to represent a population (Yin, 2018). According to Eisenhardt (1989), four to ten cross-case analyses suffice for good analytic generalization. This guideline, in turn, reveals the weakness of my study since I compare three cases. However, as Cook et al. note, external validity can be improved by clearly motivating why I chose the case companies and outlining the studies' context (1989). All respondents in my research have at least five years of experience in the fashion and retail industry and have participated in digital transformation initiatives for at least two years. As my study aims to understand the underlying mechanisms of the digital transforming capability for incumbent firms in the fashion industry, these respondents offer many insights. Furthermore, the first case company occupies the first rank in the world's most valuable brands in apparel and fashion. The 2nd case company consistently ranks in the top 5-10, and the third case company ranks in the top 50-100, respectively (Forbes, 2020; Brand Directory, 2021; Fashion United 2020). Therefore, these companies' experience in digital transformation is representative of the industry.

3.10 Research Relevance to Master Program

Investigating the microfoundation of the digital transforming capability incorporates the ethos of the Management of Technology (MoT) program at TU Delft. The master exposes students to the paradigm that the evolution of firms and technologies occurs at the intersection of people, technology, and processes, which my thesis demonstrates. Executing a digital strategy through digital transformation encourages managers to see the process as a sociotechnical one. The payoff from technology as a corporate resource rests on the people entrusted to use it. The research in this field is still nascent, which requires empirics to support theoretical building (Teece, 2018; Warner and Wäger, 2019; Sousa-Neely, Zomer, and Martinez, 2020). To bridge the gap, my thesis builds on concepts covered by the MoT program, such as technology and strategy as an entrepreneurial

process, capability- and resource-based view of the firm, and collective sense-making of technology through collaboration. Moreover, it is evident throughout my work that digital transformation is imperative for incumbent firms to have a chance to secure profits and competitive advantage. Executing such a strategy for a firm to become a digital enterprise affects the entirety of the organization. As previously discussed, the phenomenon can evolve from the transformational effect of digitalization on a business and its stakeholders. Grasping the idea means managers must gain technical knowledge on top of business acumen, which is the aim of the MoT program.

Chapter 4: Empirical Findings and Analysis

Outlined in this chapter are the main findings of the case studies. 4.1-4.5 provide a snapshot of the apparel and fashion industry within its journey through digital transformation. In each section's subchapter, I discuss the analysis of each dimension put forth in the frame of reference in Chapter 3.5, using the microfoundations subcategories adapted by Sousa-Zomer et al. (2020) based on Felin et al. (2012). I supplemented the microfoundations dimensions discovered in Chapter 2 with emergent findings from the case companies not explicitly mentioned in the extant literature. For reference, subchapter 3.6 and 3.7 discuss each case company and the representatives interviewed in the study.

4.1. Digital Transformation in Apparel and Fashion Industry

Digital transformation takes a part in each of the case company's operating models. The technology and business managers' roles evolved to include introducing new technologies in their respective departments. For example, Prep-1 and Active-1 work directly with their organization's digital departments for their respective supply chain management and buying/sourcing functions. Their roles were to introduce the new FMS solution to the global functions that each company co-innovated with SAP in 2014. "I think throughout my career [at Active AG], it has always been about continuous, changing, and improving our systems. Everything is system-driven, and it was either because of market trends or because there was a need for it to be more efficient. If I needed to change KPI or if we were launching new processes which needed monitoring, the digital department was involved in making it happen." Active-1 Similarly, Prep-1 at Prep, Corp. related the majority of their role's responsibility from 2014 to 2019 as developing new processes for the buying and sourcing group based on the new FMS platform. "So from SAP APS to SAP FMS, there were certain reports that operationally the buyers use in the business that we knew would not be part of the new platform anymore. How can I find the relevant scope in looking at any kind of analysis so that stakeholders from finance could be stakeholders from [the team] that have been working on a business transformation? [It is] this sort of expertise in the content and working across the business with other central teams." (Prep-1). In some cases, their roles have only existed in the last two years or have developed into a more digitally focused role. For example, at NRG, Inc., NRG-2's role as a senior director in product management has only existed since 2019. Similarly, NRG-3's role as a data scientist in the insights and analytics team developed from an insights analyst in Market Place Analytics (MPA) (NRG-2, 2019; NRG-3, 2019).

Another interesting finding is that digital transformation contributes to the stylistic innovation of each company. Stylistic innovation refers to the aesthetics or the symbolic value of products that typically represent fashion (Delbufalo, 2015). Aesthetic design and symbolic value of new products in fashion products carry intangible value beyond their functional attributes (Tran, 2010). Two examples provided show innovative materials and styling from the case companies. First, Active AG has the Speedfactory concept that allows a digital twin of its design, development, and production processes, which allows them to be wholly simulated, tested, and optimized in advance (Active AG "Operational Highlights," 2017; Active-1, 2021). The new techniques resulted in new technologies like "Alphaedge 4D," which is an innovative 3D-printed shoe using liquid resins and polymers that were digitally modeled and designed (Active AG, "Annual Report," p. 16, 2018). Second, one of Prep Corp.'s core brands does the design, showing, and buying almost all digitally using 3-D renderings of garments to optimize speed to market

and inventory levels (Prep, Corp., "TH Annual Report," p. 19, 2017). Consumers also benefit from digital innovations such as "smart mirrors," which use RFID technology to recognize garments and suggest head-to-toe outfits that shoppers can request directly to the fitting room (Prep, Corp., "TH Annual Report," p.12, 2019). Prep Corp.'s "smart mirrors" innovation recombines many looks from a selection of garments to increase the stylistic value of their merchandise assortments.

Furthermore, all three companies have a solid focus on the brand model. All three companies organize their companies based on each brand while operations such as supply chain, buying, and sourcing, etc., are shared services across the brands. For example, PVH Corp. has two distinct brands, Active AG has two, while NRG, Inc. has three that cover a wide range of lifestyle and sportswear segments for women, men, and kids. Their brand portfolios are interesting to note because, according to Teece (2015), a firm's brand is an intangible asset that is another non-tradable asset like dynamic capabilities that contribute to firm heterogeneity and competitive advantage. Since these companies have a portfolio of widely recognized brands with multi-billion euro revenues, they have high attractiveness for partnerships and cooperation with customers such as wholesale businesses and digital technology vendors. In fact, Active-1 noted that Active AG was part of the four-brand consortium with SAP to co-innovate the FMS because of their brand.

"We had a project for a new offering for wholesale partners like JD Sports to reduce lead times from 1-2 years to 60 days on certain product assortments. That is only possible if departments came together as planning, sales, account management, supply chain production, and then digital had every necessary data accessible across sites. We had to create a lot of new functionality in FMS. So SAP created completely new things that never existed before because they also had a really good relationship with us. Expanding their offerings was a result of our great partnership. And as a preferred customer [Active, AG] can ask for all of these new things. And in return, SAP stays aware of what the [apparel and fashion] market needs." Active-1

While the digital leadership leads digital transformation initiatives in all case companies, they rely heavily on middle management in central operations, e.g., headquarters and regional headquarters, to diffuse digital technologies throughout the organization. First, all three case companies announced at least one of the chief officers in either Digital or information in the latter half of the 2010s (NRG, Inc. in 2015, Active AG in 2018, Prep, Corp. in 2020, respectively). The dynamic environment of the apparel and fashion industry has prompted all three case companies to go through massive internal restructuring. A clear example of this is by NRG, Inc., where more digital and data product-related departments have formed since the digital strategy pivot. At NRG, Inc., these central product management roles focus the digital strategy on the relevant data products needed for the functions needing to evolve digitally.

"One of the things that [NRG-2] has done for businesses is work-shadowing planners. If you develop products, we really need to understand the [digital] strategy, but we also need to understand how people on the [shop] floor understand it … We need to make sure we are not only aligned on the future vision but also grounded in what's happening today." (NRG1 about NRG2)

A final similarity found is that companies' core businesses remain unchanged: design, manufacture, and market apparel, accessories, and footwear. However, the processes and channels that deliver these commodities have radically diversified. All three case companies emphasized the importance of direct-to-consumer (DTC), social media, and e-commerce. While most of the businesses made the majority of their revenues from B2B wholesale, DTC was by far the fastest-growing. E-commerce grew 34% at Active AG ("Annual Report," p.53, 2019), 30% at Prep, Corp. ("Annual Report," p. 14, 2019), and 30% at NRG, Inc. (NRG, Inc., 2020). Furthermore, all three case companies pursue cross-platform channels like online platforms Zalando

and Amazon along with their owned and operated e-commerce channels, while Prep, Corp. is subsequently reducing their retail store footprints ("Annual Report," p. 4, 2019). Finally, due to the multi-channel strategies these brands pursue, the first step internally for these brands is to reconfigure their data assets to have an end-to-end outlook of design, manufacturing, merchandising, and sales. Having one source of truth for these brands and the departments responsible for the value chain is fundamental for their digital transformation journeys.

To summarize, there are many similarities among the three case companies in their digital transformation initiatives, albeit in different stages. NRG, Inc. by far leads the pack by having an early-mover advantage in pursuing digital three years before No. 2 brand Active AG by its heavy digital investments discussed in-depth in the "Digital Investments" sub-section of this chapter. As pointed out in the literature, digital intensity consists of heavy, often irreversible investments in digital technologies underpinning the dynamic digital transforming capability. These investments change the companies' internal structure further discussed in the "Structural Dimension" section and how they interact and relate to consumers, elaborated in the "Process Dimension" section. The transformative potential of digitalization extends beyond the operational efficiency and effectiveness of the company and impacts the behaviors of customers and society (Vial, 2019).

Individual	Processual	Structural	Microfoundation	NRG	Active	Prep
•			Dynamic Managerial Capabilities	✓	✓	✓
•			Individual Ambidexterity	✓	✓	✓
•			Intermediate Leadership	✓	✓	✓
•			Digital Savviness	✓	✓	✓
	•		Technology Acquisition	✓	✓	✓
	•		Digital Investments	✓	✓	✓
	•		Proximity	✓	✓	✓
		•	Agile Structure	✓	X	X
		•	Decentralization	✓	X	X
		•	Risk-taking	✓	X	X

Table 3 Summary of Case Studies Findings

4.2 Individual Dimension Findings

A clear pattern emerged from the case companies when asked about the digital savviness of the workforce regarding their digital transformation journeys. First, as mentioned by Sousa-Zomer and colleagues, the number of the digital workforce needed via open positions in companies can signify digital savviness based on the individual role's descriptions (2020). Their measurement is logical since these traditionally brand-driven companies had less need for a digital workforce when most of their revenues originated from retail channels such as owned and operated stores and wholesale partners. Since the case

companies began their digital transformation journeys, they have recruited more "digital natives." The evolution of current roles emerged to become more digitally-focused to access digital distribution channels such as e-commerce. As such, 83% of open positions at Active AG in its Amsterdam office are digital and IT-related (2021). The figures for NRG, Inc., and Prep, Corp. are 33% and 22%, respectively (2021). "Since the five years it started, I still see a lot of positions open. So I think it's working and growing, and there's an everlasting demand for it." (Active-1). As Felin and colleagues pointed out, individuals' entry (and exit) affect the organization's capabilities, hence the higher percentages of digital-related vacancies.

Improving the digital maturity at NRG required both hiring digital natives and upskilling the existing business functions. The planning function transitioning to the cloud-based analytics platform was encouraged to adopt the new technologies in a training series called "The Planner of the Future." The idea behind the initiatives is to understand the new techniques and tools available to them to make them more digital-savvy in their roles. On the other hand, the agile squads must understand and create products that facilitate the planning team's change in working. For example, NRG-2 comes from a technical product development background outside of NRG. She needed to understand how the planning functions worked to create data products that were useful for their digitalization.

Aside from recruiting the digital workforce with the necessary KSA's, it was clear that the digital transformation initiatives require leadership. However, while the literature emphasizes the importance of senior leadership in digital transformation (Hess et al., 2016; Warner and Wäger, 2019; Sousa-Zomer et al., 2020), there is an increased focus on managers impacting transformative change (Helfat & Peteraf, 2015; Bojesson & Fundin, 2020). There has been an increase of digital directors at all three case companies in the last three years, as NRG-2, Prep-2, and Prep-3 have had recent leadership promotions in their respective digital departments. Consequently, this coincides with NRG, Inc.'s and Prep, Corp.'s digital transformation announcement in 2017. As mentioned in the case company descriptions and each of the participant's roles and responsibilities, their primary goal is to focus the digital strategy of each company to create relevant tools and products for the business functions transforming—for example, Prep-1 at Prep. Corp's responsibility as a manager of a central function was to develop new processes for the buying and sourcing group based on the new FMS data platform. Active-1 had a similar role at Active AG, acting as a subject matter expert for the digital team to create tools for the supply chain teams and rolling out new features to other territories globally.

At NRG, Inc., the World Headquarters initiated the enterprise-wide announcement of the Consumer Direct Offense digital strategy, which presides over three of its four markets, while the European HQ leads the EMEA market. Though the WHQ is at the top of the decision-making hierarchy of the enterprise, EHQ can make regional decisions such as Demand and Supply Management (DSM). The main strategic goal of the EMEA region is to integrate the marketplace of this region and its DSM operations using a cloud-based data platform (NRG-1, 2019). NRG-1 and NRG-2 partook in taskforces to create a significant change to the EHQ operating model. "How are we leveraging new platforms in the making while we still need to integrate data from existing platforms? How do we actually start that journey of enabling that not only at the [WHQ] level but also enabling our teams [EHQ] and territories all the way down to key cities?" (NRG-1)

Finally, the digital transformation highlights the responsibility of each individual to initiate and facilitate change. For example, the transformation came not solely from the leadership ranks of WHQ and EHQ's technology teams. For instance, NRG-3 remarked that the technology investments made by NRG leadership require the EHQ employees to change their way of working but, more importantly, their mindset. For instance, planners need to translate NRG's retail partners' sales and convert the sales into a forecast of the account's future order. The endeavor takes time, so the MPA builds the tools to optimize this process and increase its accuracy. "What we're giving to Planning is something that requires a change of mindset. I think it is going to be a slow change." (NRG3) NRG-2 mirrors the same sentiments that NRG-3 experienced when working with the business team. From the feedback, some members do not wholly see the value of the product management and product owner teams in changing the way they work. Since the current operating model has been working and is effective, the new digital transformation projects are just "Nice-to-Haves." "People think it's OK to have a certain level of inaccuracy, a certain level of taint, [and] to work manually. These things have transitioned and become more efficient and have the most accurate data set. So you are not… really optimizing our marketplace (by working the old way)." (NRG-2) At Active AG and Prep Corp., the interviewees voiced the same sentiments. Active-1 worked on digital projects from the central team rolled them out to local markets. "You see, there's more resistance from those local teams, you see the people working there 40 years or so. And then, of course, it was the change management taking way more importance."

Individual Dimension Analysis

As outlined in the frame of reference, the first dimension of the digital transforming capability refers to the individual dimension. According to Sousa-Zomer *et al.* (2020) and Warner & Wäger (2019), the individual dimension includes digital savviness, recruitment of digital natives, and digital mindset crafting. Thus, from the empirical findings, it is argued that a company builds the digital transforming capability comprised of dynamic managerial capabilities, individual ambidexterity, (intermediate) leadership, and digital savviness (maturity).

Dynamic Managerial Capabilities

Dynamic Managerial Capabilities cover a wide array of managerial knowledge, skills, and abilities that contribute to dynamic capabilities (Adner & Helfat, 2003; Ambrosini et al., 2009; Helfat & Peteraf, 2015). I observed an array of knowledge, skills, and abilities many of the digital actors in the case company exhibit around transformation. Mainly, continually improving systems and processes through coordination of people and resources across many departments become crucial. Active-1 mentioned that a large part of his responsibilities beyond cross-functional teamwork with the digital team is change management in regional teams (2019). Such activities reflect Adner & Helfat's claim that social cognition can recognize differing viewpoints and influence others' behaviors (2015). Language and communication also play a critical role in transformation, especially in Prep Corp's onboarding new members from acquired units. Prep-1 had experience training newly acquired buying and sourcing groups from TH China on the new FMS platform (2019). Language and communication is foundational individual interaction that ranges from persuasion, inspiring workers, direct visions and goals, and knowledge sharing and ultimately changing routines (Teece, 2007; Adner & Helfat, 2015).

Individual Ambidexterity

Along with dynamic managerial capabilities, individual ambidexterity contributes to exploration and exploitation to foster accumulating knowledge and enhance team performance. Extant literature has shown that organizational ambidexterity applies to the granular level of the individual. Individuals exercising ambidexterity pursue both seeking novel and complementary knowledge to one's already existing skillset and supplying that knowledge to the skillset of other individuals (Schnellbächer & Heidenreich, 2020). Cross-functional project teams at active AG and agile teams at NRG Inc and Prep Corp exemplify this concept. At NRG, business planning and tech team members must create solutions introducing cloud computing practices into the existing planning function. The planning SMEs create the business process requirements and KPIs while MPA teams understand the techniques that can accelerate activities such as cloud computing. It is similar at Prep Corp. The ABI teams work with business functions in sales and SCM to understand ways to modernize performance management techniques and planning processes while meeting business requirements.

(Intermediate) Leadership

Intermediate leaders are those who connect different levels of organizations. They are involved in multilevel leadership relationships, with their reports (from the perspective of a leader) and with their bosses (from the perspective of a follower) (Jaser, 2018). This finding emerged in all three case companies situated in the Netherlands while the world headquarters are in Germany or the United States. All participants with manager status must carry out the strategic objectives in their respective functions. Thus, they exhibit the follower perspective through operationalizing the strategy determined from the C-level (CTO/CIO/CDO-level). As a central regional function, they also are responsible as leaders to diffusing and operationalizing the digital strategies in local markets. According to Ambos & Schlegelmilch, regional headquarters and centralized operations closes the gap on information asymmetries between headquarters and local subsidiaries (2010). Managers in these central regional teams have more knowledge about the local markets than those in the HQ. They participate more in locally normalizing behaviors as central leaders, supporting the HQs need to establish a strong culture (Jaser, 2018; Ambos & Schlegelmilch, 2010).

Digital Savviness (Maturity)

In order to modernize the planning team's operations at NRG, the tech teams need to have the digital savvy to fully utilize the digital investments in cloud-based solutions and the domain knowledge in the planning function. Literature has recognized that within the Agile methodology, the bottleneck is the customer requirements analysis from the domain experts (Salvay, 2004). Using the waterfall model, the planning team has adopted an "I'll Know It When I See It" mentality when working with the agile squads on the MVPs resulting from the sprints. As observed by NRG-3, the planning team is quick to point out the faults in the forecasts in the new planning tools. The agile squads are better able to deliver MVPs without having the background in planning by enlisting subject matter experts in the planning team to request the appropriate metrics, data, and parameters to deliver MVPs. It can also be possible that through individual ambidexterity, as mentioned earlier, the tech teams and the planning

teams cross-pollinate expertise and gain knowledge in both domains. NRG-3 would be a good example since the respondent started in the planning function as an intern and grew to a data scientist role in their five-year tenure at NRG.

4.3 Process Dimension Findings

From the processual dimension, digital intensity manifests through the digital investments in central functions that enable digital transformation initiatives at all three case companies. At NRG, Inc., there are several data and analytics teams such as Enterprise Data Analytics (EDA), Marketplace Analytics (MPA), Consumer Sciences (CS), and Direct-to-Customer (DTC) under the umbrella of Commercial Analytics organization (NRG-3, 2019). At Prep, Corp., the Analytics and Business Intelligence (ABI) team manages the "functional architecture" of all the reporting and analytics used by the central functions, which eventually rolls out to the global territories (Prep-2 and Prep-3, 2019). Finally, at Active AG, it is simply called Digital (Active-1, 2019). All three organizations have complex and multilayered relationships with external vendors, consultants, and internal business functions to move the organization from a siloed data enterprise into a more autonomous, self-service analytics organization based on a singular cloud-based platform.

Furthermore, all three case companies work with many external partners extensively and have acquired them in some cases. In the 33-year history of NRG's acquisitions, six out of ten were startups, while the remaining four were legacy brands. Notably, the acquisition of the legacy brands that became NRG's subsidiaries was from 1988-2007, while its digital technology acquisitions began in 2016 to the present day. These acquisitions are the direct results coming out of NRG's direct-to-consumer strategy (Fernandez, 2020). The technology acquisitions have resulted in NRG's App Universe offering a mobile shopping experience with online communities centered on NRG sneakers, sports, training, highly customized product assortment, and operational efficiencies (Crunchbase, "NRG, Inc.", n.d.). At NRG, this phenomenon can be observed through acquisitions to support its customer-centric and customer-led digital strategy. First starting in 2016, it acquired startup Virgin Media, whose mobile-based apps connect fan communities for live music events fueled NRG's mobile shopping (NRG SNKRS), training (NRG Training Club), and running (NRG Running Club) apps as social experiences (O'reilly, 2016). The acquisition also led the company to integrate their digital and retail channels seamlessly, giving customers access to products and informing their retail partners on customer tastes from both online and offline channels (NRG, Inc., 2018a). Subsequent acquisitions, as NRG-3 mentioned, such as Zodiac, help the company data-mine consumer behavior to predict trends (NRG, Inc., 2018a). Another acquisition in 2018, Invertex, provided NRG 3D and augmented reality (AR) for mass customization and tailored e-commerce experience (NRG, Inc., 2018b). For instance, the NRG Fit app uses AR to scan and measure the user's foot to give more accurate recommendations on shoe sizes. As a result, DSM planning teams get more accurate sell-through data since one massive drawback of online shopping is the massive number of returns of online orders (). Furthermore, acquisitions have also helped NRG's operating efficiency with Catalog, a startup whose technology enables data preparation for analysis (NRG, Inc., 2021).

While NRG Inc. has a portfolio of technology acquisitions and intermittent external partnerships, Active AG and Prep Corp lag behind. Compared to the six technological acquistions by NRG Inc, Active AG made one in 2015 (Active AG “Annual Report”,

p120) and Prep Corp made none. Active AG also has three apps, "Runtastic by Active," "Active," and "Confirmed" (Active AG "Annual Report," p. 68, 2017). The suite of apps also aims at creating a social community around the brand as well as mobile access to its e-commerce sites (Active.com) and limited-edition releases (via Confirmed) (Active AG, "Annual Report," p. 66, 2018). Furthermore, it has partnered with technology vendors such as SAP to transform its entire value chain through its FMS platform (Active AG, "Annual Report," p.77, 2015) and Siemens to create computer-simulated designs and manufacturing processes called "Digital Creation" (Active AG, "Annual Report," p.78, 2017). According to Prep-1, the innovation investments at Prep Corp. are also digitizing design, production, and sales processes, such as the FMS co-development with SAP AG (2019). Since Prep Corp mainly made acquisitions in brands, it relies heavily on external partnerships with pure-play digital players such as Amazon for e-commerce penetration (Prep Corp, “Annual Report,” p.15).

The last critical sub-dimension of the processual dimension is proximity. Harkening back to the “Section 2.4 Microfoundations of Dynamic Capabilities: Learning Mechanisms and DCs”, learning is fundamental to changing organizational routines and resource base. Proximity is a relational concept that facilitates collaboration and learning across individuals (Boschma, 2005; Cunningham & Werker, 2011; Werker et al., 2016). This concept’s relevance shows throughout each case company’s digital initiatives—many of the company’s cited change management as a fundamental activity. “There’s resistance from some local markets to digital initiatives, especially people who have been working there for 40 years. However, at the central functions they were used to change hence the implementation was much easier” (Active-1).

Process Dimension Analysis

As outlined in the frame of reference, the third dimension of the digital transforming capability refers to the processual dimension. According to Sousa-Zomer *et al.* (2020) and Warner & Wäger (2019), the processual dimension includes external partnerships, technology acquisitions, and digital investments. Thus, from the empirical findings, it is argued that a company builds the digital transforming capability through heavy emphasis on digital investments and technology acquisition with some external partnerships.

Digital Investments

Investments are almost always required for organizations to develop and commercialize new products, processes, or services (Helfat *et al.,* 2007; Teece, 2007). These investments include large, and in some cases, irreversible strategic investments in both tangible and intangible assets (Ambrosini & Bowman, 2009; Teece, 2012). Top management commitment of substantial funds is necessary, even under complex and uncertain terms (Helfat and Peteraf, 2015). As the participants have alluded and their annual reports stated, all three companies have committed to investing in digital assets through digital products and services, upgraded systems, digital customer interactions, digital tools, and processes—active AG and Prep. Corp, for example, explicitly used digital technologies to digitalize their operating models. The rationale behind the end-to-end digital creation is to provide customers with precisely the products and experiences they seek, enabling organizations to make fast decisions based

Furthermore, while digital asset investment originates from the HQ level, central functions at the regional level have the unique role of operationalizing the digital strategy to the rest of the organization. On only relevant data and further improve and optimize their digital capabilities. From the experiences shared by the participants in the studies, they confirm Helfat and Peteraf's claim that the introduction of new products and services is done incrementally rather than a radical change (2015).

Technological Acquisitions and External Partnerships

Technological acquisitions and external partnerships are direct results of digital investments. Warner & Wager (2019) and Chesbrough & Schwartz (2007) suggest that these two activities contribute to building digital capabilities that the incumbent firm does not already possess. Indeed, all three companies either acquired a tech startup focused on SMACIT (Social Media, Analytics, Cloud, IoT) to build apps to connect with customers. It aligns with the DTC model rather than working with wholesalers to reach customers and understand their preferences. New digital products such as apps, planning tools, and e-commerce offerings were realized through projects with vendors, tech startups, spinoffs, and consultants and the input of customers. I discovered that these digital products and services contributed to not only new product offerings to customers but also internal processes in ways they are delivered through 3D design, simulations, and mass customization. The plethora of networked activities among the incumbent fashion companies confirm the authors claim of navigating the digital ecosystem (Souza-Zomer *et al.,* 2020).

Cognitive, Social, Spatial, and Personal Proximity

While the agile way of working has provided the conditions for coordination and action, the various proximities among the core teams and agile squads revealed the nature of their interactions. Felin and colleagues remarked that formal and informal interactions between people and processes within the firm shapes its routines and capabilities in critical ways (2012). Furthermore, authors have based these reconfiguring activities on a set of cognitive abilities such as problem solving and reasoning underpins the creation of dynamic capabilities (Helfat and Peteraf, 2015). Indeed, this is the case at NRG, where constant interaction within the core teams and agile squads are crucial to co-creating data products that improve the planning business processes. These interactions necessitate more than communication skills, though that is undoubtedly the basis of interaction in any team. Thus, a multidimensional perspective to their interaction can relate through the concept of proximity. Proximity can have spatial (distance), cognitive (knowledge absorption capacity), social (trust and commitment), and personal (individual characteristics) dimensions for which knowledge can be shared and transferred (Boschma, 2005).

First, colocation in the agile teams is a prerequisite to the team structure- agile enables fast turnaround on development and decision making through daily standups among the agile squads and meetings with the core teams. Colocation also helped the MPA team get clarity on requirements from the customers through face-to-face meetings. At Prep. Corp., it helped the central teams create ties with the newly acquired businesses in the Greater China region. In turn, training, learning, and feedback can be facilitated through both tacit and explicit knowledge sharing in face-to-face interactions (Zollo & Winter, 2002). In the literature, Martin demonstrated that even episodic or temporary team structure as a group of individuals operating autonomously in their respective domains of responsibility much of the time, but in certain circumstances collectively and interdependently act in pursuit of a common objective (2010). The Cognitive, social, and personal proximities are the

dimensions that give more insight into the nature of the interactions between the teams. For example, the respondents have cited multiple times the need to share a common language (a feature of cognitive proximity) constantly for the cross-pollination of technology and business planning concepts to create data products and services. Furthermore, the friction reveals challenges in the social and personal proximity dimensions. The respondents perceived that the customers had low commitment and trust in the MVPs that resulted from the agile sprints. Though they understood what the agile methodology entailed, management still perceived it as something imposed on them instead of willingly participating. Personal proximity also played a role in the composition of the team as NRG-2 referenced those team members who had an "early adopter" type personality and were open to prototyping to diffuse the digital mindset to the rest of the planning community vs. those who were seen as "detractors and spreading false information" (NRG- 2).

4.4 Structural Dimension Findings

From the structural dimension perspective, the case companies have the same agile way of working. To recall, the structural dimension of the dynamic digital transforming capability refers to the conditions of action and interaction that enable firms to respond to change (Souza-Zomer *et al., 2020*). NRG Inc has a highly agile structure where product-based teams use the agile methodology to organize assets and pursue projects. These squads work with Core teams composed of the planning organization's leadership and selected analysts (SMEs) to create data products and tools based on the cloud-based data foundation. The goal of this core team is to understand the DSM team's pain points for the agile squads to create minimum viable products (MVPs), which the core team rapidly tests. "*So the core team has a mix of data analysts, the engineers working from the tech department. The ideation on the requirements are product-specific so we have different core teams."* (NRG-2) Prep, Corp. works in agile as well, and there is a parallel between the MPA agile teams at NRG, Inc. and its own (Analytics and Business intelligence) ABI team. They also work with user stories and sprints to build reporting and analytics tools for various departments. The various departments have subject matter experts that create the user stories for the ABI product owners, and they co-create the data products through sprints. "*Representatives from the business describing the specifications to the development team. After a week or three, we will have sprints and then review. Obviously, there's also touchpoints in-between the developers and I to appeal or directly to the stakeholder.*" (Prep-2) They do this to move away from the functional and department data silos to more integrated data capabilities. Data source integration means that product development and decision-making falls on the appropriate departments and teams.

Given that NRG, Inc., and Prep, Corp. both work with Agile methodology, the teams are predominantly co-located. At NRG, Inc., the Core teams needed to meet periodically to iterate on the data products and get the required features. It also enables faster knowledge-sharing among external partners. NRG-3 remarked that when implementing a new tool from an external vendor, there were many misalignments in features and customer requirements. *"This really helped us a lot because we didn't do it in the first month of the project. And after we started sitting together, it changed our productivity and performance completely and also probably became much, much faster. "*Prep-1 had the same comments when working with the new FMS and the Chinese team. "*One person in our team was always travelling there, training everyone there step by step, really*

breaking it down and making sure that they can, from our content knowledge perspective, meet the personal needs and ability to carry out my tasks."

The deviation among the case companies comes from Active AG. Active AG works in a more top-down approach where "Digital Leaders" appoint members from the digital department and the business functions to work on projects they have determined to have digital strategic value (Active-1; Active AG, "Annual Report," p. 65, 2017). The team refers to the concept of "top-down, bottom-up," which is information and decisions are "empowered" and delegated from the top, while details of the final decisions are fed from the bottom up (Active AG, "Annual Report," p. 235, 2017). In practice, Active-1 described the process as "*very centrally- steered." They had a very established way of working and structure. Timelines are very clear and approved at the board level*." This prolonged decision-making due to seeking out management opinion as tie-breakers. "*When it came to the project decision or just overall decisions, there was an approval needed from someone higher, and that was costing to take a lot longer than necessary*." (Active-1)

Structural Dimension Analysis

As outlined in the frame of reference, the second dimension of the digital transforming capability refers to the structural dimension. According to Sousa-Zomer *et al.* (2020) and Warner & Wäger (2019), the structural dimension includes a risk-taking culture, nimble and agile structure, and multi-divisional structure. Thus, from the empirical findings, I found that the case companies pursue the three sub-dimension in varying degrees.

Decentralization

As the literature suggests, decentralization assists in digital transformation through enabling faster decision-making by enabling lower levels of the firm to make them (Teece, 2007; Warner & Wager, 2019; Sousa-Zomer et al., 2020). The case companies showed that Active AG slows down the decision process due to project leaders and members not having enough decision-making power. As a result, a project takes to complete anywhere from one to five years, as stated by Active-1. This cadence matches Active AG's "Five year plan" announced in 2015 (active AG "Annual Report," 2015). In contrast, NRG Inc employs an agile methodology both in strategic planning and business operation. NRG announced their consumer-direct strategy and, after two years, announced again an acceleration plan. In their organization, while the WHQ set the strategic path, the regional HQ (EHQ) had the decision power to create programs, products, and services that realized the strategy in the EMEA market (NRG-1, 2019). Decentralization was not explicitly named in Prep Corp. However, the activities of the ABI group headed by Prep-2 and Prep-3 follow a decentralized approach. They work with several departments to prioritize their KPIs and data products they want to create since they are the experts on their business functions (Prep-2, 2019; Prep-3, 2019).

Agile

Helfat and Peteraf (2015) and others have been proponents of deploying or reconfiguring firm resource bases towards opportunities. Throughout the study, NRG Inc. and Prep Corp's technical leads reinforced that investments in new digital skills and initiatives drive change in how the business functions work through new data products and services. In order to achieve

this, the two companies work in an agile way, using the Agile methodology. Traditionally used in IT and digital departments, the methodology has been ubiquitous in firms aiming to become digital enterprises (Hess *et al.,* 2016). Organizational agility is "the capacity of an organization to efficiently and effectively redeploy/redirect its resources to value-creating and value protecting (and capturing) higher-yield activities as internal and external circumstances warrant" (Teece *et al., 2016*). Similarly, researchers found that organizations who use agile in their IT and digital departments work with scrum masters, product owners, proofs-of-concept, and MVPs to continually renew digital offerings (Rigby *et al., 2016*). This method of working enables flexibility, organizational slack, and open innovation processes between the Core teams and the Scrum teams at NRG and Prep work on data products and tools for the business functions driven value. The purpose of this method is to co-create with the customer on digital solutions, quicken development, and decision making, and orchestrate agility through external partners (Teece, 2016).

Adopting it has created pitfalls with Agile's benefits over a more traditional waterfall project management model. First, authors have highlighted that agile needs to permeate the organization's broader digital transformation strategy instead of executing projects (Hess et al., 2016; Sebastian et al., 2017). With the case of NRG, the vision of the integrated EMEA market catalyzing a whole new data platform capability based on cloud-computing technologies demonstrates this more comprehensive, transformational digital initiative. All three respondents highlight the critical pillars of Agile at NRG as the value-driven development of data products and tools and continuous learning from feedback from their customers in the planning team. At Prep, Corp., standards on the data platform and the creation of KPIs must be established first before any development or migration to the platform could be pursued. After every sprint, the agile squad releases an MVP for a feature for the planners, and the Core team assesses the outcome to provide directions for the product's enhancements. The findings found it challenging to transform if only the digital departments worked agile because it can create friction with the business processes.

Risk-taking Culture

As mentioned, literature claims that entrepreneurial activity leads to new competitive advantage-inducing products and services (Teece, 2012). Some scholars claim that entrepreneurial activity requires risk-taking and creativity (Somsing &Belbaly, 2017; Sousa-Zomer, 2020). The risk-taking activity only emerged in NRG Inc, where the regional HQ model encourages decision-making to be made quickly at the appropriate level. They could pursue digital products and services through an agile method only based on rapid learning and not specific requirements (Salvay, 2004). Still, a perceived personal risk from employees hindered the agile process since they found that it threatened their already established way of working. In the other two case companies, the more centralized structure made by top managers in central teams slowed the decision process down and only followed strict guidelines on project objectives and goals. While risk-taking can incentivize creativity, the lack of perceived psychological safety for failure or free expression hindered innovative activities (Fainshmidt & Frazier, 2017).

4.5 Building Digital Transforming Dynamic Capability

The figure below summarizes the empirical findings in a framework based on the interviewed firms. The overview is grounded in the digital actors' experiences in leading and implementing digital transformation projects based on their firm's digital strategies. The digital transforming dynamic capability comprises three key elements: individual, processual and structural dimensions. The individual dimension is elaborated as "Knowledge, Skills, and Abilities", where I found that individual ambidexterity, dynamic managerial capabilities, and intermediate leadership are additional microfoundations to digital transformation. Under the processual dimension, "Technology and Ecology" and "Coordination and Integration" elements such as digital investments, technology acquisition, and external partnerships were observed. In addition, proximity as a condition for coordination and integration was also present based on the interview responses. Finally, structural dimensions include "Organizational structure and culture" which entails enterprise agility, decentralization, and a risk-taking culture.

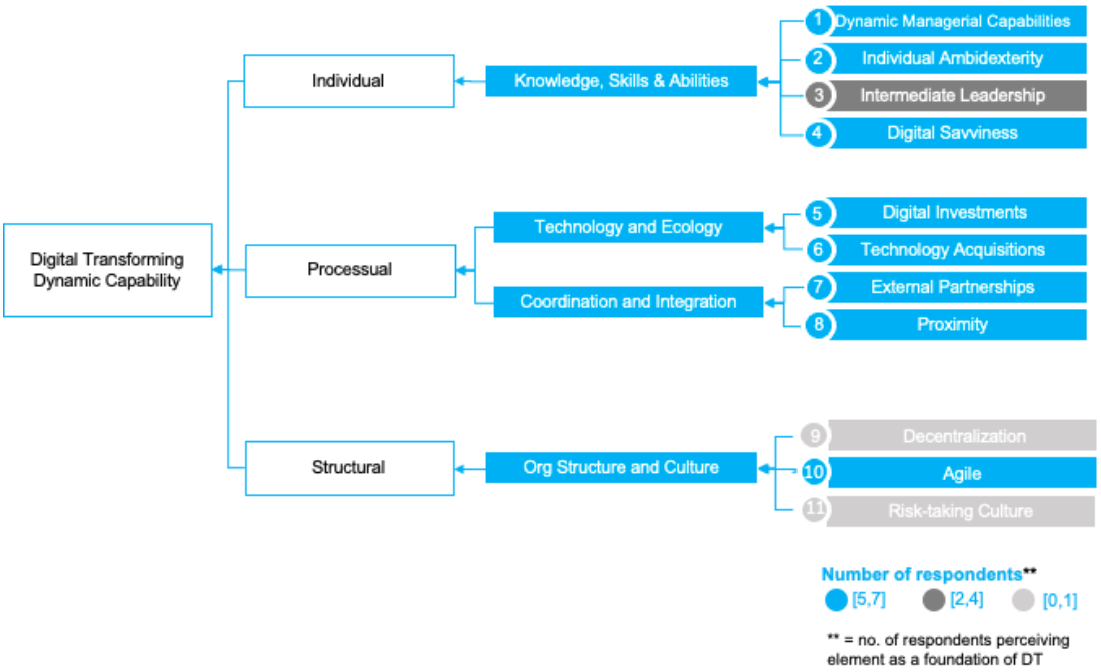


Fig 11. Microfoundations of the Digital Transforming Dynamic Capability Framework

The final framework shows that while eleven elements contribute to the dynamic capability for digital transforming, not all are perceived as impactful in the three incumbent firms. In the individual dimension, the wide array of cognition activities related to DMCs such as language and communication and social cognition contribute to the complex orchestration of various digital initiatives from digital end-to-end design and cloud computing analytics. Individual ambidexterity aids in knowledge seeking and offering among the agile teams and cross-functional project teams. Intermediate leadership among the top management team, middle management, and employees within different levels of the firm help diffuse the digital strategy objectives and operations. Regarding Technology & Ecology, digital investments in new technologies such as cloud computing and 3D designs modernize and create new value creation paths for the firms. In some cases, the digital investments lead to technology acquisitions and lasting external partnerships to build the dynamic capability for digital transformation. The relational aspects in proximity aids in

the learning and collaboration processes in implementing new technologies and realizing the firms' digital strategy. Finally, the structural dimension of decentralization, agile structures, and risk-taking support the individuals learning and collaborating to build dynamic capability for transformation.

Chapter 5 Reflection and Future Directions

5.1 The Building Blocks of the Digital Transforming Capability

My thesis contributes to the ongoing research on dynamic capabilities, especially regarding examples of building dynamic capabilities via microfoundation to manage organizational reconfiguration, by answering the question: What are the building blocks of the digital transforming capability for a retail company undergoing digital transformation? The answer is an adapted dynamic capabilities microfoundation framework based on three clusters: individual, structural, and process dimensions related to digital transformation presented in Chapter 4 Analysis.

On their view on digital transformation, all research participants have the resounding sentiment that it underlies driving change in the entire organization. Driving change is equally an individual's responsibility as it is an organizational one. The microfoundations perspective means recognizing that an organization comprises individuals with different beliefs, values, and knowledge bases. As the fashion and retail industry continually becomes disrupted by different digital business models, incumbent firms can influence the creation of their organizational capabilities through their individuals' entry (and exit).

Furthermore, as mentioned in the literature, the individual dimension is the foundation of the building capabilities through individual ambidexterity and cross-pollination of domain expertise in groups. Thus, I argue that more focus should be on how individuals contribute to building dynamic digital transformation capability. The KSA's of individuals are highly personal, and thus, their combinations and recombinations in groups can create a source of heterogeneity among the firm performance. Previous studies have attributed this solely to top management teams and leadership. Still, the empirical findings show that the digital maturity of the workforce has more impact on building the firm's digital transforming capability through their actual operationalization of the firm's digital strategy through various initiatives. The roles of individuals in the central functions in the case of companies demonstrate this, as they have the unique responsibility to root the digital strategy from the executive leadership in the daily reality of current business operations. Thus, intermediate leadership is crucial in bridging the digital strategy at the headquarter level and operations in the lower levels of organizations to close information asymmetry and socialize norms about engaging with new digital technologies. Therefore, beyond digital savviness, I also considered the individual's capacity for ambidexterity, dynamic mindset, and intermediate leadership as components of dynamic digital transforming capability.

Building on the individual dimension is the structural dimension, enabling and constraining individual and collective action within the organization. My findings revealed that nimble, agile structures enabled quick decision-making, while a top-down approach prolonged the process. The two case companies that exhibited agile characteristics combined and recombined knowledge bases and domain expertise to create value-driven products. In contrast, the non-agile case company experienced creativity blocks and tunnel vision. Furthermore, my study highlighted proximity to be important in facilitating knowledge sharing and effective individual ambidexterity. Temporal collocation could create enough social ties among NRG and Prep members to learn effectively and co-innovate. Cognitive, social, and personal proximity demonstrated the interactions among members of the group to either hinder progress or enable successful outcomes.

In conjunction with the individual and structural dimensions, the process dimension defined the digital intensity needed to build the digital transforming capability. My findings in the case of companies aligned with the literature, which cites digital investments, external partnerships, and technological acquisitions, are digital transforming capability's microfoundations. These components help the fashion and retail industries to create new digital products and services, enter new marketing channels, and cooperate with key partners within and across its industry boundaries. By investing in digital assets and working with external partners such as vendors and consultants, I argue that it is a fundamental element that helps enterprises digitally transform, reinforcing the notion that dynamic capabilities are both internally and externally developed.

Consequently, my findings suggest that although each dimension has various activities and unique characteristics, they are all intertwined. I discovered that digital transformation's dynamic capability has an iterative and mutually involved individual, structural, and processual dimension. The categories themselves provide a way to conceptualize microfoundations of dynamic capabilities. Their components are interlocked and interdependent. Furthermore, my findings indicated that the dynamic capability could combine other dynamic capabilities studied in the literature, such as brand value and acquisitions, which offer attractive future research opportunities.

5.2 Integrating Empirics and Theory

Helfat et al. (2007) highlight an equal need for research on dynamic capabilities processes and the constraints encountered to take new strategic paths. While some of the components have the characteristics of microfoundations generating dynamic capabilities, they also pose constraints on organizational reconfiguration. The two identified challenges of structural dimension relate to proximity and adopting the agile way of working within the context of the specific case of the firm. Further, the barriers – inertia and the fixed mindset of the digital laggards – can be labeled as internal constraints. However, the firm can overcome internal constraints. Relating to the microfoundation perspective of routines and capabilities, focusing on how individuals interact and repetitive learning can lead to the routinization of the transforming capability.

A microfoundations perspective is helpful for understanding and explaining organizational and dynamic capability and disaggregating organizational capability. Looking at the organization as a whole unit overlooks parts that are unique to a specific organization. Furthermore, each individual has specific KSAs and experiences aggregating to organizational routines and capabilities. This view requires analysis at the individual level and understanding appropriate intervention. From empirical exploration, digital interventions are more likely to succeed when focusing on the people and their interactions within the organization. If each individual understands the vision behind transformation and can commit to it, barriers to transformational change are easier to overcome. As such, individual ambidexterity supports the importance of individual-level factors, highlighted in previous studies (Helfat and Peteraf, 2015). Helfat and Peteraf (2015) also identified language and communication, and social cognition as microfoundations generating the reconfiguring capability, enabling communicating visions and goals. This study extends this by suggesting that the multidimensional proximity concept can be a lens to investigate the nature of interactions among individuals beyond language and communication. Furthermore, Dixon et al. (2014) introduce microfoundations, knowledge acquisitions, knowledge internalization, knowledge dissemination, resource reconfiguration, resource divestment, and resource integration as generating the dynamic capability of adoption. These microfoundations are in different ways and combinations manifested in the underlying components of the process, structure, and individual dimensions

of the digital transforming capability: dedicated resources and investment, individual ambidexterity to facilitate knowledge seeking and sharing, and continuous feedback. Teece (2012) noted that continuous feedback is related to knowledge creation to contribute to the company's dynamic capabilities. By building on the ongoing discourse on microfoundations, this study contributes to the existing theory on dynamic capabilities and the current stream of investigation about microfoundations that generate dynamic capability in the digital transformation context.

5.3 Limitations

However, possible limitations exist in this study. Because I did my research through three case studies, it limits its generalizability. Even so, an analytical generalization could be a path for other companies and industries such as fast-moving consumer goods to apply this framework. These components may also be helpful to identify individual firms' own context-dependent individual, process, and structure dimensions. A second research limitation is the risk of bias because the author has worked at the organization and participated in an internal digital transformation initiative. To decrease the bias risk, I researched another similar but different digital transformation initiative in other departments. Another limitation is that while the author's native language is English, all respondents in the study have English as a second language. Therefore, I had to pay close attention to the subtext when individuals answered questions about challenging individual and team dynamics. While my study clarified some answers with follow-up questions, I judged others based on the context of the situation in line with the reflexive research approach. As a final limitation, I did not consider the relative importance of each factor. My omission is due to the respondent's answers varying lengths to elaborate situations and context, expected in semi-structured interviews. Nevertheless, the relative importance of a factor connected to the intentions behind a transformation initiative may be an exciting area to investigate. Another proposal for future research is the longitudinal action research study of the routinization of individual interactions within the study working with other company departments. As the literature has suggested, there's a difference between ostensive and performative routines, where people's description (ostensive) may differ from the actual execution (performative) of the routines (Ambrosini and Bowman, 2009; Salvato and Rerup, 2011). This method comes with its challenges with cost and the direct participation of the researcher in the study.

5.4 Future Directions

While I answered the exploratory question and revealed significant findings concerning the capability to engage in high-tech environments through digital transformation continually, I motivated additional research in this developing field. Transferring the findings to a broader research context is difficult since the observations are directly related to the fashion and retail industry enterprises. As noted throughout this study, the seasonality and trend-driven characteristics of the fashion industry are highly volatile and unique, unlike other fast-moving consumer goods industries. A suggestion to continue the academic agenda forward is through quantitative methods to measure the technical and evolutionary fitness of the firm's digital transformation capabilities on their growth, performance, and survival. This may call for longitudinal studies to study the change processes and developments over time. Digital transformation is about sustaining engagement in digital technologies over time. A time-based study can illuminate further insights on the development of dynamic capabilities, implementation, and change of organizations

within dynamic environments. Each company's specific context can be further acknowledged and highlighted to explain strategic actions on the organization's reconfiguring mechanisms. As seen in the studies, firms utilized both external parties and internal processes to build digital capabilities, and it would be worth pursuing the difference in their impacts.

Organizations perceive digital transformation as an imperative to pursue sustainable value creation. The ever-changing technological landscape urges organizations towards new paths of value creation and reconfigured over time to successfully shape, adapt, and their resource bases to match their new digital reality. The process of building the dynamic digital transforming capability is a concert of ongoing individual, structural, and processual reconfigurations to enable them to leverage new digital technologies and cope with changing consumer tastes and the new competition in the future.

5.5 Conclusion

Management research has shown me that middle-range theories are difficult to measure due to the many factors with which it confounds. Creating a model that says that a dependent variable directly affects an independent variable is very difficult. Yet, the dynamic capabilities aim to demonstrate that their existence directly affects firm performance and the creation of sustainable, profit-making competitive advantage. I remained agnostic in this claim because many authors have since challenged this notion. Yet, I found it compelling that although the companies are essentially the same, selling commodities with little differentiation (a shoe is a shoe), they have vastly different market values. And one of the core tenets of dynamic capabilities is to explain the heterogeneity of performance of firms. Following this notion has led me to a wide variety of explanations in the literature. But taking the position of the microfoundations perspective, it seems to boil down to the nuclear component of the organization: the individual. The dynamic managerial capabilities have since put forth that the cognitive capacities of each individual have an effect on how they sense, seize and transform the corporate resources under their supervision.

Furthermore, the combination of the individuals in collaborative settings also creates a different capacity, or routine, that goes beyond the individual's knowledge, skill, and ability. Hence, I was interested in the learning mechanisms often-cited as the microfoundation of any capability-based theory of the firm and dynamic capabilities. Researchers claim ostensive and performative dimensions of routines in dynamic capability literature. The ostensive dimension is how knowledge can be explicitly shared or codified through the description, while the performative dimension is how knowledge is tacitly experienced. Authors have advised ways to research this correctly, but the enormous cost of gathering grounded data is not achievable in a master thesis. Yet, my thesis shows that this is a worthwhile endeavor due to the explanatory power of microfoundations to show the differences in seemingly similar firms.

Another complexity of this type of research is its multi-level nature. One of the issues of dynamic capabilities is that they are hard to locate. Capability-based theory of the firm aggregates its capacity and ability to perform activities reliably and sustainably at the firm level. Yet, operationally, groups of people coordinate and orchestrate these

activities across and top and bottom in the organization. Martin has shown this in the episodic teams of business unit general managers and Helfat and Taylor in middle managers as boundary spanners. More often than not, these levels have the oversight of both the operations and strategy of the firms, hence their unique position as intermediate leaders. This is also a significant finding that I saw in my research since translating the digital transformation strategy into specific products and services was the most oft-cited challenge of the managers.

The digital transforming as a dynamic capability project concludes my master's in Management of Technology at TU Delft. The dynamic capabilities framework extends the capability-based view of the firm to show that it is necessary to change the organization's ordinary capabilities to fit its changing environment. The theory primed me to investigate how firms could do the digital transformation in the digital environment. Alas, the microfoundations of the capabilities framework show that building capabilities are multi-pronged: individual human capital, structural enabling contexts, and processual coordination of the firm's technological ecosystem. My findings showed that learning and collaboration among diverse individuals is a linchpin of building ordinary or dynamic capabilities through stable and patterned routines.

Bibliography

adidas group (2017). Annual Report, adidas group, https://www.adidas-group.com/ media/filer_public/6a/69/6a690baa-8430-42c5-841d-d9222a150aff/ annual_report_gb-2017_en_secured.pdf.

adidas group (2018). Annual Report, adidas group, https://www.adidas-group.com/media/filer_public/e9/ba/e9bad34f-ca11-44f6-977f-364d0650feaf/annual_report_gb-2018-en _secured.pdf

adidas group (2019). Annual Report, adidas group, https://report.adidas-group.com/2019/en/

adidas group (2021). History, adidas group, https://www.adidas-group.com/en/ group/history/

Adner, R., & Helfat, C. E. (2003). Corporate effects and dynamic managerial capabilities. *Strategic Management Journal*, *24*(10 SPEC ISS.), 1011–1025. https://doi.org/10.1002/smj.331

Ambrosini, V., & Bowman, C. (2009). What are dynamic capabilities and are they a useful construct in strategic management? International Journal of Management Reviews, 11(1), 29–49. https://doi.org/10.1111/j.1468-2370.2008.00251.x

Ambos, Björn & Schlegelmilch, Bodo : The New Role of Regional Management. Palgrave Macmillan UK, 2010, DOI:10.1057/9780230273870. - ISBN 978-0-230-53875-7.

Araujo, L. (2014, October 14). HANA simplification: SAP Fashion Management. Retrieved July 06, 2021, from https://blogs.sap.com/2014/10/14/hana-simplification-sap-fashion-management/

Barreto, I. (2010). Dynamic Capabilities: A review of past research and an agenda for the future. Journal of Management, 36(1), 256–280. https://doi.org/10.1177/0149206309350776

Bertola, P., & Teunissen, J. (2018). Fashion 4.0. Innovating fashion industry through digital transformation. Research Journal of Textile and Apparel, 22(4), 352–369. https://doi.org/10.1108/RJTA-03-2018-0023

Baxter, P., & Jack, S. (2008). Qualitative case study methodology: Study design and implementation for novice researchers. The qualitative report, 13(4), 544-559.

Bendig, D., Strese, S., Flatten, T. C., da Costa, M. E. S., & Brettel, M. (2018). On micro-foundations of dynamic capabilities: A multi-level perspective based on CEO personality and knowledge-based capital. Long Range Planning, 51(6), 797–814.

BoF (2021). The state of fashion in 2021, McKinsey.

BoF (2020). The state of fashion in 2020, McKinsey.

BoF (2019). The state of fashion in 2019, McKinsey.

BoF (2018). The state of fashion in 2018, McKinsey.

Bojesson, C., & Fundin, A. (2020). Exploring microfoundations of dynamic capabilities – challenges, barriers, and enablers of organizational change. Journal of Organizational Change Management, 34(1), 206–222. https://doi.org/10.1108/JOCM-02-2020-0060

Boschma, R. (2005). Proximity and Innovation: A Critical Assessment. Regional Studies, 39(1), 61–74. https://doi.org/10.1080/0034340052000320887

Bowen, G. A. (2009). Document analysis as a qualitative research method. Qualitative research journal, 9(2), 27-40.

Charmaz, K. (2006). Constructing Grounded Theory: A Practical Guide Through Qualitative Analysis. In Sage Publications (Vol. 18).

Chesbrough, H., & Schwartz, K. (2007). Innovating Business Models with Co-Development Partnerships. Research-Technology Management, 50, 55 - 59.

Delbufalo, E. (2015). The influence of supply network structure on firm's multiple innovation capabilities: A longitudinal study in the fashion industry. Management Decision, 53(10), 2457–2476. https://doi.org/10.1108/MD-07-2014-0431

Dubois, A., & Gadde, L. (2002). Systematic Combining - An abductive approach to case research. Journal Of Business Research, 55, 553-560.

Easterby-Smith, M., Lyles, M. A., & Peteraf, M. A. (2009). Dynamic capabilities: Current debates and future directions. British Journal of Management, 20(SUPP. 1). https://doi.org/10.1111/j.1467-8551.2008.00609.x

Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic Capabilities: What Are They?, *21*(10), 1105–1121.

Fainshmidt, S., & Frazier, M. L. (2017). What Facilitates Dynamic Capabilities? The Role of Organizational Climate for Trust. Long Range Planning, 50(5), 550–566. https://doi.org/10.1016/j.lrp.2016.05.005

Haffke, Ingmar & Kalgovas, Bradley & Benlian, Alexander. (2016). The Role of the CIO and the CDO in an Organization's Digital Transformation.

Helfat, C. E., Finkelstein, S., Mitchell, W., Peteraf, M., Singh, H., Teece, D. J., & Winter, S. G. (2007). Dynamic Capabilities and Organizational Process. In Dynamic Capabilities: Understanding Strategic Change in Organizations.

Helfat, Constance E., Peteraf, M. A. (2013). Managerial cognitive capabilities and the microfoundations of dynamic capabilities. *Strategic Management Journal*, *850*(August), 831–850. https://doi.org/10.1002/smj

Helfat, C. E., Finkelstein, S., Mitchell, W., Peteraf, M., Singh, H., Teece, D. J., & Winter, S. G. (2007). *Dynamic Capabilities and Organizational Process*. *Dynamic Capabilities: Understanding Strategic Change in Organizations*.

Hess, T., Matt, C., Benlian, A., Wiesböck, F., 2016. Options for formulating a digital transformation strategy. MIS Quarterly Executive, 15(2).

Hsu, CC, Tsaih, RH, Yen, DC, 2018. "The Evolving Role of IT Departments in Digital Transformation," Sustainability, MDPI, Open Access Journal, vol. 10(10), pages 1-18, October.

Kane, G. (2017), Digital Transformation is a Misnomer, available at: https://sloanreview.mit.edu/article/digital-transformation-is-a-misnomer/ (accessed 23 June 2021).

Kane, G., Palmer, D., Phillips, A.N., Kiron, D. and Buckley, N. (2017), "Achieving digital maturity", MIT Sloan Management Review, available at: https://sloanreview.mit.edu/projects/achieving- digital-maturity/ (accessed 10 December 2017).

Manyika, J., Chui, M., Brown, B., Bughin, J., Dobbs, R., Roxburgh, C., & Byers, A. H. (2011). Big data: The next frontier for innovation, competition, and productivity.

Martin, J. A. (2010). Dynamic Managerial Capabilities and the Multibusiness Team: The Role of Episodic Teams in Executive Leadership Groups. *Organization Science*, *22*(1), 118–140. https://doi.org/10.1287/orsc.1090.0515

Martin, J.A. and Eisenhardt, K.M. (2004). Coping with decline in dynamic markets: corporate entrepreneurship and the recombinative organizational form. In Baum, J.A.C. and McGahan, A.M. (eds), Advances in Strategic Management: A Research Annual. New York: JAI– Elsevier Science pp. 357–382.

Matt, C., Hess, T., Benlian, A., 2015. Digital transformation strategies. Business Inf. Syst. Eng. 57 (5), 339–343.

Nike, Inc. 2018a. "NIKE, Inc. Acquires Data Analytics Leader Zodiac"

Nike, Inc. 2018b. "Nike Acquires Invertex"

Nike, Inc. 2021. "NIKE, Inc. Acquires Data Integration Expert Datalogue"

Oreilly, Lara (2016). "https://www.businessinsider.com/why-nike-acquired-virgin-mega-sneakers-2016-8"

Parrilli, M. Davide & Alcalde Heras, Henar. (2016). STI and DUI Innovation Modes: Scientific-Technological and Context-specific Nuances. Research Policy. 45. 10.1016/j.respol.2016.01.001.

PVH Corp (2021). About us, PVH Corp., https://www.pvh.com/company/about

Salvato, C., & Rerup, C. (2011). Beyond collective entities: Multilevel research on organizational routines and capabilities. Journal of Management, 37(2), 468–490. https://doi.org/10.1177/0149206310371691

Saunders, Mark; Lewis, Philip; Thornhill, A. (2016). Research Methods for Business Students. In Pearson (Vol. 112). https://doi.org/10.1192/bjp.112.483.211-a

Schnellbächer, B., & Heidenreich, S. (2020). The role of individual ambidexterity for organizational performance: examining effects of ambidextrous knowledge seeking and offering. Journal of Technology Transfer, 45(5), 1535–1561.

Senivongse, C., Bennet, A., & Mariano, S. (2019). Clarifying absorptive capacity and dynamic capabilities dilemma in high dynamic market IT SMEs. VINE Journal of Information and Knowledge Management Systems, 49(3), 372–396. https://doi.org/10.1108/VJIKMS-11-2018-0105

Sousa-Zomer, T. T., Neely, A., & Martinez, V. (2020). Digital transforming capability and performance: a microfoundational perspective. International Journal of Operations and Production Management, 40(7–8), 1095–1128. https://doi.org/10.1108/IJOPM-06-2019-0444

Steele, V. & Major, J. S. (2015). Fashion industry, ENCYCLOPÆDIA BRITANNICA, 3.

Svahn, F., Mathiassen, L., Lindgren, R., 2017. Embracing digital innovation in incumbent firms: how Volvo cars managed competing concerns. MIS Q. 41 (1), 239–254.

Tanriverdi, H., Lim, S.-Y., 2017. How to survive and thrive in complex, hypercompetitive, and disruptive ecosystems? The roles of IS-enabled capabilities. In: International Conference of Information Systems, Seoul, South Korea.

Tallon, P. P., Ramirez, R. V., & Short, J. E. (2013). The Information Artifact in IT Governance: Toward a Theory of Information Governance. Journal of Management Information Systems, 30(3), 141–178. https://doi.org/10.2753/MIS0742-1222300306

Taylor, A., C. E. Helfat. 2009. Organizational linkages for surviving tech- nological change: Complementary assets, middle management, and ambidexterity. Organ. Sci. 20(4) 718–739.

Teece, D.J., Pisano, G. and Schuen, A. (1997). Dynamic capabilities and strategic management. Strategic Management Journal, 18, 509–533.

Teece, D. J. (2007). Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. Strategic Management Journal, 28(13), 1319–1350. https://doi.org/10.1002/smj.640

Teece, D. J. (2012). Dynamic Capabilities: Routines versus Entrepreneurial Action. Journal of Management Studies, 49(8), 1395–1401. https://doi.org/10.1111/j.1467-6486.2012.01080.x

Teece, D.J., (2014). The foundations of enterprise performance: dynamic and ordinary capabilities in an (economic) theory of firms. Acad. Manag. Perspect. 28 (4), 328-352

Teece, D., Peteraf, M., Leih, S., (2016). Dynamic capabilities and organizational agility: risk, uncertainty, and strategy in the innovation economy. Calif. Manag. Rev. 58 (4), 13–35.

Teece, D. J. (2018). Profiting from innovation in the digital economy: Enabling technologies, standards, and licensing models in the wireless world. Research Policy, 47(8), 1367–1387. https://doi.org/10.1016/j.respol.2017.01.015

Vial, G. (2019), “Understanding digital transformation: a review and a research agenda”, Journal of Strategic Information Systems, Vol. 28 No. 2, pp. 118-144.

Vogel, R., & Güttel, W. H. (2013). The dynamic capability view in strategic management: A bibliometric review. International Journal of Management Reviews, 15(4), 426–446. https://doi.org/10.1111/ijmr.12000

Wang, C. L., & Ahmed, P. K. (2007). Dynamic capabilities: A review and research agenda. International Journal of Management Reviews, 9(1), 31–51. https://doi.org/10.1111/j.1468-2370.2007.00201.x

Warner, K. S. R., & Wäger, M. (2019). Building dynamic capabilities for digital transformation: An ongoing process of strategic renewal. Long Range Planning, 52(3), 326–349. https://doi.org/10.1016/j.lrp.2018.12.001

Wessel, L., Baiyere, A., Ologeanu-Taddei, R., Cha, J., & Jensen, T. B. (2021). Unpacking the difference between digital transformation and it-enabled organizational transformation. Journal of the Association for Information Systems, 22(1), 102–129. https://doi.org/10.17705/1jais.00655

Winter, S. (2003). Understanding dynamic capabilities. Strategic Management Journal, 24, 991–995.

Yin, R. K. (2003). Case Study Research: Design and Methods, 3rd edn. Sage: Newbury Park, CA.

Yin, R. K. (2018). Case study research and applications : design and methods. In Journal of Physics A: Mathematical and Theoretical (Sixth edit, Vol. 44). Los Angeles: SAGE.

Yoo, Y.; Henfridsson, O.; and Lyytinen, K. The new organizing logic of digital innovation: An agenda for information systems research—research commentary. Information Systems Research, 21, 4 (December 2010), 724–735.

Zollo, M., & Winter, S. G. (2002). Deliberate Learning and the Evolution of Dynamic Capabilities. Organization Science, 13(3), 339–351. https://d

Appendix I Case Study Interview Protocol

This research project represents the core project of my Master Thesis for the Management of Technology Program at the Delft University of Technology.

Objective
The main goal of the project is to add empirical evidence to how established firms in traditional industries successfully undergo digital transformation and how they execute their digital strategy. This research objective originated from the question posed by Sousa-Zomer et al. (2020): *"What are the building blocks of the digital transforming capability from the dynamic capabilities view?"* The authors argued that dynamic capabilities, a specific type of capabilities that evolve from ordinary capabilities, allow them to respond to the continuous change that emerges from the ongoing process of digital transformation. To answer this question, incumbent firms executing their digital strategy are investigated to analyze current practices and approaches during their digital transformation initiatives, uncover their challenges and barriers throughout the process, and offer insights into how the digital transforming capability is built.

Approach
The project is carried out in the regional HQ of global retail brands situated in the Netherlands with their digital departments and their business function counterparts. It consists of a preliminary literature review of Digital Transformation and Microfoundations of the Dynamic Capabilities Framework. The resulting theoretical framework is built on three dimensions of capabilities for digital transformation (Individual, Structural, and Processual) and their respective microfoundations. The Individual dimension deals with the knowledge, skills, and abilities (KSAs) of the workforce and leadership; the Processual dimension deals with investments, partnerships, and acquisitions; finally, the Structural dimension concerns organizational culture and structure. The cases have been selected to offer insight into both successful (and unsuccessful) capability building in digital transformation in well-established retail companies. The outcome of the case studies will be an improved framework and a set of practical recommendations for building the digital transforming capability.

The interview

The interviews have been organized in order to gather real-life information on the process of building dynamic capabilities for digital transformation. The meetings are recorded to transcribe and analyze the collected information using dedicated software. This software shows patterns of key concepts within the cases. Afterward, cross-case analysis will be performed to pattern match across different cases and elaborate on dimensions of microfoundations of digital transforming capability.

Confidentiality
All the collected data will be processed confidentially and will be used for research purposes of my Master's thesis.

Interview's structure and questions
1. Opening
    1.1. Introduction of myself and of the thesis project
    1.2. Confidentiality
    1.3. Methods
    1.4. Summary of the interview and interview's objectives

5 years BPM operational efficiency

2. Case study
    2.1. Can you please briefly describe the nature of the project and your role in that?
    2.2. What was <Company's> digital strategy and what did you want to achieve with the digital transformation?

3. Individual dimension (Digital savviness)
    3.1 Can you describe your experience in participating in DT initiatives?
    3.2 Can you describe the team working on the DT initiatives?
    3.3 Can you explain more about digital leadership in your company?

4. Structural dimension (Conditions for Action and Interactions)
    4.1 Which attitude did the people have towards the DT initiative?
    4.2 What were the main points of alignment/misalignment? In your opinion, what were the underlying causes?
    4.3 How did relations on a personal level influence the information and knowledge exchanges during the DT project?

5. Processual dimension (Digital Intensity)
    5.1 Can you describe <Company's> external partnerships in its DT journey?
    5.2 Can you describe <Company's> technology-based acquisitions and their purpose?
    5.3 Can you describe <Company's> digital investments and their purpose?

6. Learnings
    6.1. If I missed any important element, could you tell me what and elaborate on that?
    6.2. What was the lesson learned?
    6.3. Looking back at the scope and motive of the collaboration, to what extent did you eventually have a common understanding and where are you now?

7. Ending
    7.1. What did you think of the interview?
    7.2. Could you recommend to me any other relevant case to consider or a person I should talk to?

Appendix II Interviews Transcript Summaries

Interview Active-1 at Active AG

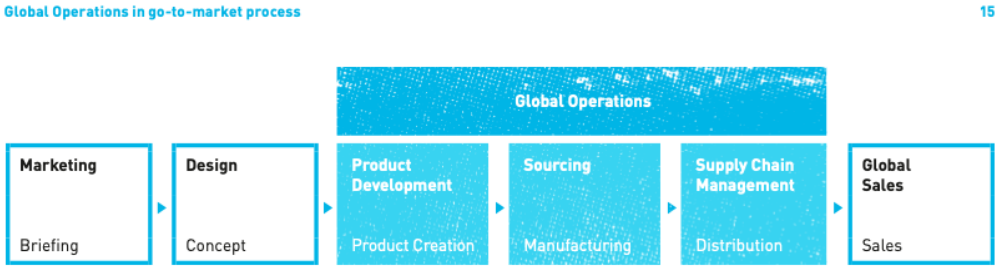
1. Introduction

Per the interview protocol presented in Appendix I, we opened with informal introductions. I thanked the participant and explained how I have defined digital transformation along with the aim of my research. I explain why I conducted semi-structured interviews and assured the anonymity of their personally-identifying data. I asked and gained permission to record and transcribe the interview.

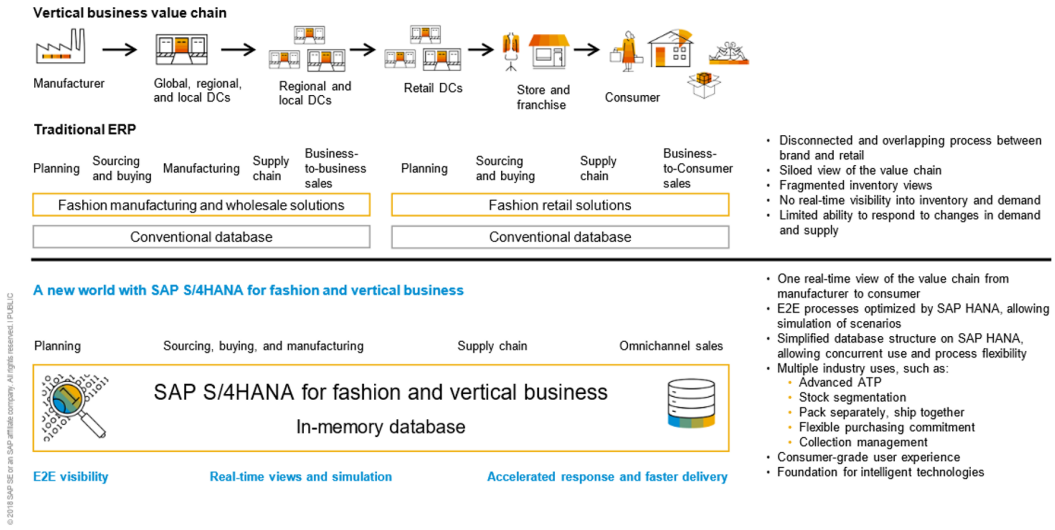
- Active-1 was a supply chain business process manager at Active AG for five years. In his role he experienced the beginning of the digital transformation journey at AG, starting with the "Creating the New" strategy in 2015, a five-year plan by the company to increase brand equity through digital. In 2017, this effort was redoubled with the "Creating the New" Acceleration Plan, which established the "Digital Leadership Team" to map out the brand's digital priorities in e-commerce, speed, and digital end-to-end supply chain.
- Active-1 was appointed as SME on these digital transformation initiatives since Amsterdam is the innovation and supply chain management hub of Active AG. One initiative under the Speed strategy was "Never out of stock", which allowed wholesale partners such as JD Sports, Footlocker, etc. to reproduce and replenish in-season, popular products within 60 days. This was supported by the transition from Apparel and Footwear Solutions (AFS) to the Fashion Management System (FMS) platform, which combined the end to end process of the planning, manufacturing and merchandising of products. Active AG's goal is to have one source of truth for all the go-to-market processes. Active-1 worked with the newly formed digital department to develop the SCM KPIs that will be tracked based on the real-time data in the FMS platform to support projects in e-commerce, SCM, and production planning.

2. Digital Transformation at Active AG

The digital transformation at Active AG was a strategic investment to gain competitive advantage. Active-1 highlighted that speed was one of the tenets of the digital strategy, which is aided by multiple initiatives across different functions with the digital department overseeing the program. The below figure exhibits Active AG's go-to-market process via its Global Operations Strategy (Active AG, "Global Operations Strategy", p.74, 2017). The strategy includes Speed as a main tenet, and that means digitalizing the end-to-end process of the firm's global operations. As such, Active-1 was involved in multiple initiatives to connect data from different departments such as finance, planning, merchandising, etc. to determine how to reduce lead times for high-demand products.



The transition from multiple legacy ERP systems of AFS to FMS streamlines the go-to-market process based on one platform. This allows different views of the products from different channels, whether it is wholesale or e-commerce, as well as within their development and production pipeline (Cusack, "SAP S/4HANA for Fashion and Vertical Business: Retail, Wholesale and Manufacturing Under one Roof", 2020).

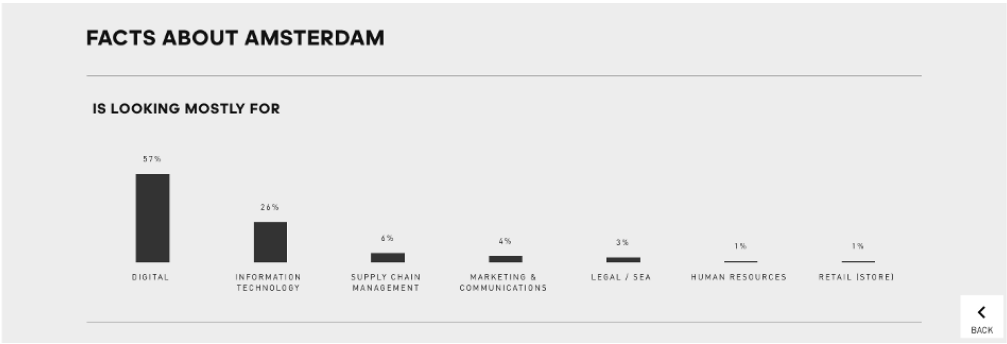


(source: https://blogs.sap.com/2020/06/18/sap-s-4hana-for-fashion-and-vertical-business-retail-wholesale-and-manufacturing-under-one-roof/)

3. Digital Transforming Capability Dimensions

Individual (Personal Experience and KSAs)

- Active-1 was chosen as a SME on projects relating to supply chain planning and logistics by the department heads who oversee digital transformation initiatives. They contributed to defining KPIs and developing processes for internal customers as a SCM data owner.
- They are often in a cross-functional team which always includes developers from the digital team. Depending on the project, members from finance, analytics, e-commerce, and logistics would be assigned.
- Their responsibility extends from the Amsterdam hub and into the global teams in all of Active AG's regions and territories.
- From their experience, digital was welcomed as a newly formed department in the Amsterdam office.
- They foresee the digital team growing, as more and more demand for e-commerce and digital growth has been outlined in the Active AG's five year plan in 2020 "Create the New"
- As Active-1 noted, the growth of the positions for digital at Active has grown, with 83% of open positions being digital-related (Active AG, 2021)



Structural (Organizational Structure and Culture)

- Decision-making at Active AG is top-down. Department heads organize teams and choose participants for the digital initiatives. They also have approval/veto power on final decisions, especially for tie-breaking.
- The digital department is a central function separate from IT infrastructure. They are core members in project teams with business function representatives with a department head as a sponsor.
- Active-1 consults with the digital team on the necessary requirements for system changes and acts as an internal customer. Their customers are the global teams and the territories under his department in SCM.
- The timelines on the projects are pre-determined by the digital leaders with a clear road-map. As such, projects (and decisions) take very long ranging from at least six months to two years.

- Regional HQs and World HQs are quicker to respond to change and implement new innovations. Some regions such as Latin America have no such systems and often lag behind. Some territories in Europe have fixed mindsets on accepting new processes, since they have worked in the same systems for 20-30 years.
- It is worth mentioning that Active AG is over 100 years old and has changed company structures from country-managed subsidiaries to more regions, hence the fragmented systems.

Process (Digital intensity, investments and partnerships)

- As mentioned Active AG is over a century old and prone to tunnel vision, hence Active-1 had plenty of interactions with consultants and outside vendors such as EY and SAP.
- One of the most fundamental transformations was the integration of all the ERP systems at Active AG, which was co-innovated with SAP. According to Active-1, since Active AG is a big client of SAP, they were more open to creating new features and enabling new functionalities for them. In turn, SAP has a good understanding of what the future needs are of the apparel and fashion industry in terms of its platform services.
- Yet another big investment aside from the global FMS was the digital department and e-commerce. Active AG has quoted between €300-700 million in its 2017-2019 annual reports, with the sizable portion of the investments going to e-commerce. With a goal of €4 billion (25%) of its revenue through digital and e-commerce, the company has created a digital hub in Amsterdam and its WHQ in Germany. They have also partnered with app developer Runtastic to release Active AG apps. They acquired the company in 2015, which spurred the creation of their fitness app “active Runtastic”, e-commerce app “Active”, and the limited release collections app “Confirmed” (Crunchbase, “Active AG company financials”, 2021). According to Active-1, large investments in digital is a core part of Active AG’s to reach more customers and strengthen their bonds.

4. Reflection

- While the digital leadership was empowering and approachable, it was cumbersome to approach them to make tie-breaking decisions, especially when there are already subject matter experts working on projects. Sometimes they struggled with creativity, especially with tunnel vision. This creates tension since they may be knowledgeable in one part of an organization, which creates a certain perspective when conceptualizing how solutions will affect other parts of the company. Thus, the organized and structured strength became a hindrance to innovation.
- Thus, external partnerships were very important for Active AG. Working with vendors and consultants helped the company with the creativity and tunnel vision challenge. They were able to bring perspectives into the projects without the hindrance of culture or being tied to how things were normally done.

Interview Prep-1, Prep-2, Prep-3 at Prep., Corp.

1. Introduction

Per the interview protocol presented in Appendix I, we opened with informal introductions. I thanked the participant and explained how I have defined digital transformation along with the aim of my research. I explain why I conducted semi-structured interviews and assured the anonymity of their personally-identifying data. I asked and gained permission to record and transcribe the interview.

Prep-1

- Prep-1 was a buying and sourcing business process development manager at Prep. Corp for five years. In his role he experienced the transition of Prep Corp. into a more digital enterprise starting with its transition to FMS. Being one of the founding co-innovators of the FMS with SAP, Prep Corp. was one of the first clients that implemented the solution in 2014. For Prep-1, this means that his roles involved building reporting and self-service analytics in the platform for buying and sourcing departments globally.
- Prep-1 was designated as SME on the transition into the new FMS platform as he is in the central operations of buying and sourcing in Amsterdam HQ. During this transition period, Prep. Corp also acquired 100% of its previous joint-venture with its Chinese licensees for its “TH” brand in China. For Prep-1, this means also onboarding a completely new department from China to use the same systems that was currently being transitioned to in the Amsterdam HQ. The goal of his team was to develop processes that connected buying and sourcing data to other departments of the company such as finance, logistics, and manufacturing.

Prep-2

- Prep-2 works as a director in Analytics and Business Intelligence at Prep. Corp for four years alongside Prep-3. He is a functional architect that designs analytics and reporting products for the business functions at Prep Corp., with a focus on supply chain management. He was part of migrating the reporting layer of SAP solutions into the new FMS platform. This led him to pursue also one vendor for all the reporting and analytics with the business functions. He asks a product owner in scrum teams and works with business function representatives.

Prep-3

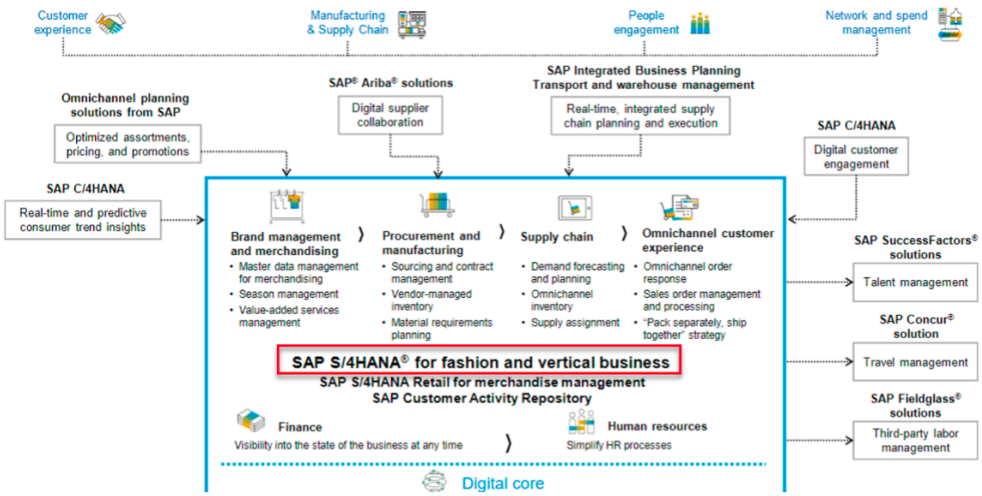
- Prep-3 is a senior director in Analytics and Business Intelligence at Prep. Corp for 10 years. He oversees the functional architects that design the analytics platform at Prep Corp. The systems have evolved over the years and he is continually managing different platforms and vendors. Since the transition into the all-in-one FMS platform, his team has also pursued one platform for the reporting and analytics. He oversees the programs where the functional architects work with the business functions to raise awareness of the team’s function and the new tools’ migration. He acts as a scrum master for multiple scrum teams.

2. Digital Transformation at Prep. Corp

Digital transformation at Prep Corp. is all-encompassing, from its distribution channels, to operating models, as well as customer interaction. Recognizing the upside in digital, a portion of its €300 million capital expenditure is towards upgrading its supply chain systems and digital commerce platform (Prep, Corp. “Annual Report”, p. 39, 2017). According to Prep-1 majority of his work from 2014-2019 was transitioning all of the reporting tools into the new FMS while also onboarding the newly acquired region in China for the “TH” brand. The transition into the one data platform also prompted the transition into one vendor for reporting and analytics, which is headed by the ABI department. Prep-3 oversees this program to ensure the centralization of all the systems migration and to reduce overlap. Prep-2 manages a portion of this program with specific departments such as SCM. Prep-1 designs the KPI’s and works with ABI to create these front-end tools and then train the global teams on the new processes and technology. ABI also centralizes the reporting and analytics processes as well as raises awareness to the rest of the HQ of the new developments. Central functions such as Prep-1’s develop new processes that are then diffused to the regions and subsidiaries of PVH Corp.

One such digital transformation initiative is managing the end-to-end supply chain of products. Prep-2 works with the sales organization to understand what collection, or assortment of designs are in the pipeline to be released. This includes sizes, colors, materials etc. Depending on how the products perform through the sales data, certain product design changes can be made which are captured through the reporting platform. The products are then tracked through its lifecycle through the data platform via KPIs relevant to the business functions, i.e. cost, lead-times, sales, etc. Having the FMS platform as the basis of all of the supply chain information allows the ABI team to offer different

insights into the product's life cycles for various teams. Then, Prep-1 can create reports that can be localized to the regions, i.e. sales performance in EMEA or production costs per style/category in China.



(source: https://blogs.sap.com/2020/06/18/sap-s-4hana-for-fashion-and-vertical-business-retail-wholesale-and-manufacturing-under-one-roof/)

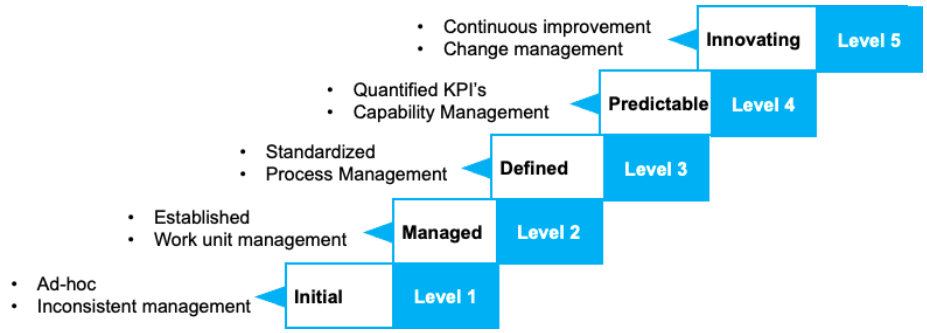
3. Digital Transforming Capability Transformation

Individual (Personal Experience and KSAs)

- Prep-1 was designated as an SME for buying and sourcing that defines the data product requirements for the reporting and analytics tools to track KPIs. He also works with multiple teams as a data product owner for buying and sourcing, working with commercial finance, logistics, and design for example.
- Prep-1 was also part of the central team that was in charge of on boarding the buying and sourcing department from the newly acquired “TH” China brand from a previous joint-venture.
- In these two roles, he had a combination of subject matter expertise and leadership. On one hand, it was designing and understanding the KPIs most relevant for buying and sourcing that connected to other departments such as finance and logistics. On the other hand, once these tools were created and tested, change management followed so that the global teams could adopt them.
- Prep-2 and Prep-3 as a central function works in advocating for the new platform migration and change management. Working with different business functions, they understand that the legacy systems used have no standards and need to be centralized across brands for accurate reporting.

Structural (Organizational Structure and Culture)

- Prep-1 commented that as a central function, he had to determine at what stage each of the brand/region is at their digital maturity. He cited Hammer’s model (2007) and capability maturity model in determining where they are in the process of digital maturity. As such, depending on where the regions are he switches his approach. The lower levels are more about change management and training while the upper levels are taking feedback and co-developing capabilities with the development team. “Pooling” resources is the goal of the central function to streamline operations and make faster decisions.
- For the lower levels of maturity, such as the China team, Prep-1 noted that face time is crucial. Members of the team would fly back and forth to Hong Kong to meet with the team and build rapport while transitioning them into the central tools developed in the Prep Corp. HQ.



Capability Maturity Model Integration (CMMI) (Objective Management Group, n.d.)

- Prep-2 and Prep-3 work in scrum teams. This allows them to ensure standards and focus on development, minimizing the overlap across brands and departments characteristic of the siloed capabilities approach. Each business function has a different focus thus a different KPI with different data requirements. In the beginning, if the team has ad hoc and inconsistent management, standards are established in sprints. When standards are established then KPIs are designed that leads to the front-end reports development. The end goal of the sprints is to create self-service analytics tools that the departments themselves can use for analysis and depreciating siloed, localized reporting tools and processes. The ABI team partners with the central functions in the Amsterdam HQ to create these reports which are then diffused globally after testing.

Process (Technology & Ecology and Conditions for Action and Interaction)

- According to Prep-2 and Prep-3 the ABI was created in 2017 as a push for the centralization of all the data and analytics resources at Prep. Corp. across all of its brands. The company's annual report quoted an increase of €80 million a year for upgrading and enhancing the operating, supply chain and logistics systems and digital commerce platforms (Prep. Corp., "Annual Report", p. 39, 2017).
- The company has also pursued an omnichannel strategy to upgrade retail systems to connect to their digital platform such as smart mirrors technology to provide an "endless aisle" experience, partnering with pure players in digital such as Tmall and Zalando, and its own e-commerce site tommy.com (Prep. Corp, "TH", p. 19, 2017).
- As previously discussed by Prep-1 the AFS to FMS was a huge investment in concert with SAP that was launched in 2014, which took five years to implement and adopt into the company, while also onboarding newly acquired China region to be on the same systems.

4. Reflection

- According to Prep-2 and Prep-3, ABI as a central function has challenges in setting standards and ensuring that departments in the HQ and their counterparts in territories know about the tools available to them and to move away from siloed sources. They end up questioning the numbers behind the reports rather than the explanation behind trends and behavior.
- Prep-2 highlighted that constant feedback from business functions about the data products is crucial, even outside of sprints to guide the development in the right direction. It also helps them gain confidence in the new ways of working.
- Prep-1 mentioned that he hardly thinks about the strategy, as it changes frequently. What anchors his role is the customers that he serves, other central departments and the buying and sourcing departments in regional territories. Strategy is a given from the HQ leadership and his focus is on how to operationalize it to the lower levels of the organization.

Interview NRG-1, NRG-2, NRG-3 at Prep., Corp.

1. Introduction

Per the interview protocol presented in Appendix I, we opened with informal introductions. I thanked the participant and explained how I have defined digital transformation along with the aim of my research. I explain why I conducted semi-structured interviews and assured the anonymity of their personally-identifying data. I asked and gained permission to record and transcribe the interview.

NRG-1

- NRG-1 is the Senior Director of Data Product in Analytics and Reporting - Marketplace Analytics (MPA) in DSM. His role is to lead integrated squads to create data products for the data enablement of the planning team using cloud solutions. He has a 20-year tenure at NRG with various digital transformation initiatives in the Demand and Supply Management team at the European HQ.

NRG-2

- Senior Manager of Data Products in Analytics and Reporting (DSM) overseeing teams that build technical and analytics products for the demand, inventory, and merchandise planning organization. She has a two year tenure at NRG, Inc. with six years experience in product management in a large personal health technology company based in Eindhoven.

NRG-3

- Data Scientist in the Marketplace analytics (MPA) that consolidated into the Commercial Team. He is one of the technical members of NRG-2's squads that partners with business functions such as DSM to create data products used for analytics by the business functions.

2. Digital Transformation at Prep. Corp

The project under study started in June 2017 when the company announced a consumer focused-growth strategy by leveraging digital technologies to accelerate product innovation. This new strategy led to a consolidation of NRG's geographies that also integrated its direct-to-consumer retail and e-commerce channels (NRG, 2017). In 2020, the company announced the digitally-empowered phase of the consumer-centric strategy to unify investments in data and analytics, demand sensing, insight gathering, inventory management, and other areas against an end-to-end technology foundation to accelerate its digital transformation (NRG, 2020). The scope of the case is within the European HQ of NRG in the Netherlands and the digital transformation initiative to modernize the Demand and Supply Management (DSM) operations from siloed data to a cloud-based data and analytics platform (NRG-1, 2019). Using NRG's company annual reports, databases of news coverage and semi-structured interviews, the narrative of the case is summarized below (NRG, 2017; NRG, 2020).

The project started in the Consolidation Phase, with the enterprise-wide announcement of the Consumer Direct Offense strategy in the Vision Phase. This digital strategy is initiated in the NRG World Headquarters which presides over three of its four markets, while the European HQ leads the EMEA market. Though the WHQ is at the top of the decision-making hierarchy of the enterprise, EHQ is tasked with regional decisions such as Demand and Supply Management (DSM). The main strategic goal of the EMEA region is to integrate the marketplace of this region as well as its DSM operations using a cloud-based data platform (NRG-1, 2019).

This marks the organizational restructuring in the Formation phase. The consolidation of the EMEA region meant that instead of integrating the individual siloed data marts of each territory, the creation of the cloud-based data platform from scratch facilitated the transition of the disparate territories into one integrated market (Ambos and Schlegelmilch, 2010).

In order to achieve this strategy, NRG in EHQ uses agile squads from the Marketplace Analytics (MPA) and Enterprise Data & Analytics (EDA) teams that consult with and build data products for the DSM planning functions to become more digital-savvy.

In line with the agile methodology, these squads work with Core teams which are composed of the planning organization's leadership and selected analysts (SMEs) to create data products and tools based on the cloud-based

data foundation. The goal of this core team is to understand the DSM team's pain points for the agile squads to create minimum viable products (MVPs) which the core team rapidly tests.

Though there are dedicated resources for the digital transformation of the EMEA region in the EDA and MPA teams, the transformation phase is denoted by technological and organizational challenges. While technological challenges are supported by external partners such as IBM and Deloitte that provide assistance to facilitate the digital transformation initiative, the organizational reshuffling revealed new issues. While within the core teams and agile squads directors and managers from DSM, EDA, and MPA have aligned vision in digital transformation, the lower levels of the DSM organization, i.e. individual planners, did not see the value in the integration. For example, the WHQ has created training programs like "Planner of the Future" to modernize ways of business planning from cost-control methods to consumer-based planning and demand sensing. Still, all interviewees remarked that the more challenging problem is on the "business side".

Generally, while the EMEA integration seemed to have the resources and investments in the new technical teams and external partners, diffusion of the digital transformation strategy was lost to the rest of the organization during its execution. While the technical MPA and EDA teams work at an agile pace, the business DSM team follows business planning calendars and sees the digital transformation initiatives as secondary.

While the teams have launched data products to the DSM planning organization, the technical leadership are reluctant to say it has digitally transformed due to the organization's frozen mindset. Generally, the digital initiative to transition to the cloud-based platform has been marred by the disconnect between the Agile-dictated pace of the tech teams and the Integrated Business Planning (IBP) calendars of the DSM team. The presence of digital natives and digital-savvy leaders, directors, and workforce (at least in the tech team) is present in the Individual Dimension to build the dynamic digital transforming capability. In terms of the Processual dimension, digital intensity is also accounted for with the sizable investment in the EDA and MPA teams, the cloud-based services, and the cenlistment of external consultants such as IBM and Deloitte. However, friction exists in the Structural Dimension with the agile methodology introduction as a condition for action and interaction. The agile squads and Core teams to build data products for the DSM team seems to be seen as an intrusion on the current operations the business planning team follows according to the integrated business planning calendars. In short, the introduction of new conditions for action and interaction to create the digital transforming capability of NRG has disrupted its current operating capabilities.

3. Digital Transforming Capability Transformation

Individual (Personal Experience and KSAs)

- Digital transformation highlights the responsibility of each individual to initiate and facilitate change. The transformation was not solely pushed from the leadership ranks of WHQ and EHQ, especially the technology teams.
- It also heavily emphasized the importance of the digital savviness of the workforce at NRG to deploy its digital strategy. Improving the digital maturity of the organization came from multiple sources. The planning function that was transitioning to the cloud-based analytics platform was encouraged to adopt the new technologies in a training series called "The Planner of the Future". The idea behind the initiatives is to understand the new techniques and tools available to them to make them more digital-savvy in their roles. On the other hand, the agile squads are tasked to create products that facilitate the planning team's change in working. This paradigm shift is achieved through taking in "Digital Natives" into the team
- Leadership and change management is continually highlighted by NRG-1 and NRG-2. Their roles include helping the lower levels of the organization subscribe to new ways of working and collaboration, as well as empowering them to own the trajectory of change in their roles.

Structural (Organizational Structure and Culture)

-

- The NRG EHQ organization has also moved away from the functional and department data silos to more integrated data capabilities. This means that product development and decision-making are relegated to the appropriate departments and teams. In this case, the data products that are being built are localized in the EHQ team rather than being developed and decided upon by the WHQ in the US. While localizing the team to create data products has allowed quicker communication and collaboration, the outcomes of the collaboration have been challenged and debated
    - The emphasis on co-location and frequent contacts among the analytics teams and planning teams
    - Leadership councils that periodically integrates all the analytics teams to create an enterprise-wide vision

    - Push for agile for a similar way of working
    - Core teams set the vision for the product as well as the data product creation
    - Lessons learned from quarterly feedback sessions
- Cross-functionality of the teams that has a product focus

Process (Technology & Ecology and Conditions for Action and Interaction)

- Digital intensity is observed through the digital investments in creating the EDA department and the cloud-based solutions for the newly integrated EHQ. NRG displays the commitment to its digital transformation ambitions with its dedicated resources in the MPA and EDA to facilitate the renewal of the DSM planning activities and beyond They have also elicited partnerships from consultants and vendors that help them improve the enterprise's digital maturity. For example, a new planning tool from IBM was being adopted by the planning team, and the MPA team was in charge of its rollout. Having both the business planning analyst, an analytics analyst, and the IBM vendor co-located facilitated a fast learning feedback loop that allowed the rollout for the new tool go smoother (NRG-3). Having dedicated resources to the project creates systematic deadlines and urgency for follow-through. Consequently, the types of projects the tech teams pursued and the core teams created were largely based on ROI's.

- NRG has had large digital investments as well as in technological acquisitions. In the 33-year history of NRG's acquisitions, six out of ten were startups while the remaining four were legacy brands. It is notable that the acquisition of the legacy brands that became NRG's subsidiaries were from 1988-2007, while its digital technology acquisitions began in 2016 to the present day. These acquisitions are the direct results coming out of NRG's direct-to-consumer strategy (Fernandez, 2020). The technology acquisitions have resulted in NRG's App Universe offering mobile shopping experience, online communities centered on NRG sneakers, sports, and training, highly customized product assortment and operational efficiencies.

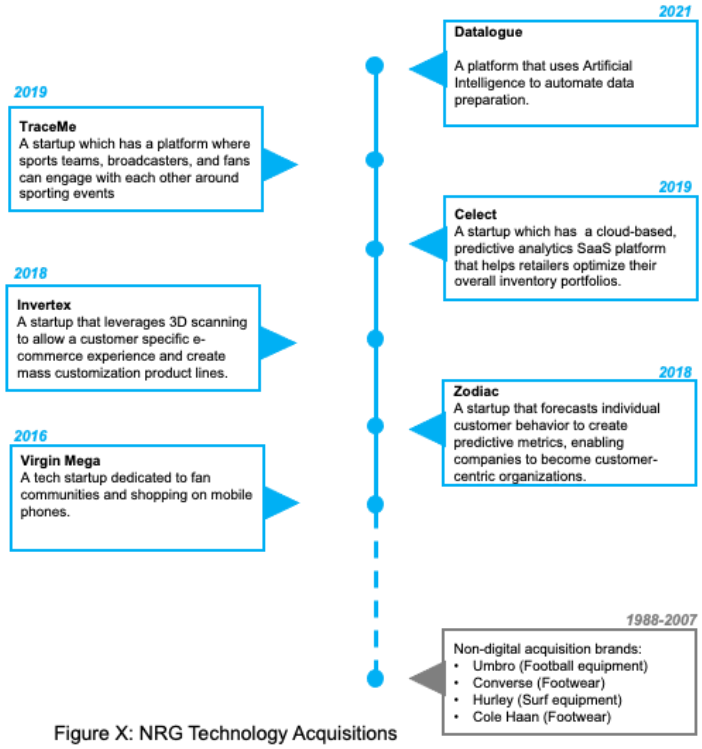


Figure X: NRG Technology Acquisitions

- NRG-3 remarked that NRG's technology investment has signaled to the planning organization on NRG leadership's digital transformation initiatives. This has also lead to reinforcing the top-down approach on digital transformation where leadership's commitment has nudged the non-tech teams such as planning to become more digitally savvy,

NRG has developed a suite of apps that keep customers engaged with content and community features, while gathering consumer data to inform its strategy.

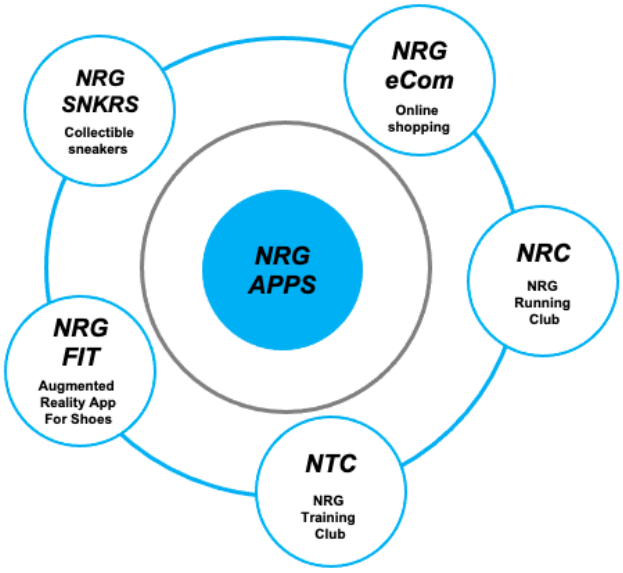


Figure X: NRG Apps offerings using mobile, AR, cloud-computing technologies to create brand loyalty through the NRG Membership

4. Reflection
    - NRG-1 stressed that constant change is inevitable in the digital transformation at NRG, urging his direct reports to own their skills journey and the trajectory of their growth and expertise.
    - NRG-2 believes that the systems are foundational, and the real change comes from diffusing the technology to the rest of the organization. The biggest barriers to that are the mindset crafting of the end users to subscribe to new ways of doing things and the inertia of being an already successful company.
    - NRG-3 highlighted the need to be constantly in communication with scrum teams and the end users to capture the right requirements and develop value-adding data products. In the beginning, communication is well-facilitated if the teams are collocated and are able to share information quickly and frequently.