

BUILDING DYNAMIC CAPABILITIES FOR DIGITAL TRANSFORMATION: AN ONGOING PROCESS OF STRATEGIC RENEWAL

Abstract

In this qualitative study, we explore how incumbent firms in traditional industries build dynamic capabilities for digital transformation. Digital transformation has been defined as the use of new digital technologies, such as mobile, artificial intelligence, cloud, blockchain, and Internet of things (IoT) technologies, to enable *major business improvements* to augment customer experience, streamline operations, or create new business models. In making sense of digital transformation, we discovered that leaders in various industry circles use the term inconsistently to describe various strategizing and organizing activities; in addition, the term has gained limited scholarly attention as a context for study of strategic change. Drawing on senior executives' experiences with leading digitalization projects at incumbent firms, we propose a process model comprising of nine microfoundations to reveal the generic contingency factors that trigger, enable, and hinder the building of dynamic capabilities for digital transformation. Our findings reveal that digital transformation is an ongoing process of using new digital technologies in everyday organizational life, which recognizes agility as the core mechanism for the strategic renewal of an organization's (1) business model, (2) collaborative approach, and eventually the (3) culture.

Key words

Dynamic capabilities; Digital transformation; Digitalization; Microfoundations; Qualitative interpretive research; Strategic agility; Strategic renewal; Technology and innovation management

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Introduction

Digital transformation has become a strategic imperative on leadership agendas (Fitzgerald et al., 2013; Hess et al., 2016; Singh and Hess, 2017), but there is little conceptual or empirical research that examines *how* organizations are digitally transformed. Fitzgerald et al. (2013: 2) define digital transformation as, “the use of new digital technologies (social media, mobile, analytics or embedded devices) to enable *major business improvements* such as enhancing customer experience, streamlining operations, or creating new business models.” Liu et al. (2011: 1730) argue that digital transformation is “as an organizational transformation that integrates digital technologies and business processes in a digital economy.” Relatedly, Singh and Hess (2017:124) suggest the term “transformation” rather than “change” emphasizes that an organization’s digital transformation goes far beyond functional thinking and holistically considers the “comprehensiveness of actions” that must be taken to exploit the opportunities or avoid the threats that stem from digital technologies. Rogers (2016: 308) argues that “digital transformation is fundamentally not about technology, but about strategy,” meaning that senior leadership teams must find ways to capitalize on new and unexpected business model innovations that optimize customer needs and experiences.

Hess et al. (2017) report that incumbent firms face significant challenges even if senior leadership teams are internally motivated to support the digital transformation of business models, structures, and processes. A major challenge incumbents face is the competing concern of needing to balance the exploitation of existing capabilities while also building new digital capabilities that are compatible with the path dependencies of the past (Svahn et al., 2017). However, despite these tensions, the building of capabilities for digital transformation has received limited scholarly attention and is now an essential context for the study of strategic change.

In contrast, the dynamic capabilities framework has become one of the most active research streams in the strategic management literature because this area of study explains how firms respond to rapid technological and market change (Eisenhardt and Martin, 2000; Di Stefano et al., 2014; Helfat et al.,

2007; Teece, 2007; Teece et al., 1997). Dynamic capabilities are innovation based and provide the capacity to create, extend, and modify a firm's resource base (Helfat et al., 2007). Teece (2007) argues that dynamic capabilities consist of three broad clusters: (1) *sensing* opportunities (and threats), (2) *seizing* opportunities, and (3) *transforming* the organization's business model and wider resource base. Given the disruptive nature of digitalization, we posit that the dynamic capabilities framework is a powerful lens for examining the digital transformation of incumbent firms in traditional industries. In particular, it has been reported that firms need to build strong dynamic capabilities to rapidly create, implement, and transform business models to remain relevant in the emergent digital economy (Achtenhagen et al., 2013; Karimi and Walter, 2015, 2016; Teece, 2018; Teece and Linden, 2017; Velu, 2017). However, despite some microfoundations research on building dynamic capabilities for strategic change (Bendig et al., in press; Dixon et al., 2014; Helfat and Peteraf, 2015; Prange et al., 2017; Teece, 2007), there is scant research that examines *how* organizations build dynamic capabilities for digital transformation.

To explore these microfoundations, we ask: *How do incumbent firms in traditional industries build dynamic capabilities for digital transformation?* To answer this research question, we present multiple case study research on the digital transformation of seven incumbent firms that are headquartered in Germany and that dominate traditional industries (Eisenhardt and Graebner, 2007). We took a novel approach because we combined a wide scope of qualitative data to draw on senior executives' experiences with leading digitalization projects in both strategy consultancies and incumbent firms. Early on in our research project, we conducted interviews with the senior partners of strategy consultancies who are authors of published industry reports and used these data as a platform to examine the digital transformation of incumbent firms. Therefore, we focus on the senior leader's perspective (Chia and MacKay, 2007; Jarzabkowski, 2004; Regnér, 2008; Whittington, 2006), emphasizing the individual leader's point of view concerning the practice of strategic activities for digital transformation. This fine-grained analysis allowed us to make sense of digital transformation by bringing participant voices to the forefront (Gioia et al., 2013).

Our study makes two contributions to the literature. First, we conceptualize and define the *scope* of the digital transformation process. Our fieldwork revealed that the term "digital transformation" is

inconsistently used by leaders within and across industry contexts to describe various strategizing and organizing activities. Using Agarwal and Helfat's (2009) strategic renewal perspective, we provide an empirically grounded definition of digital transformation. We argue that the scope of each digital transformation is contingent on the strategic renewal of an organization's (1) business model, (2) collaborative approach, and eventually the (3) culture. We report on a wide sample of case firms at early stages that have experimented with digitizing business models and at advanced stages that have used digital technologies to replace collaborative approaches or refresh organizational cultures. In line with Yoo (2010), our findings emphasize that genuine digital transformations are an ongoing process of using digital technologies in everyday organizational life. We contribute to the business model and digital transformation literature and provide a rich context for the study of strategic change.

Second, we contribute to the organizational capability literature and provide empirical insights into what types of digitally based dynamic capabilities might be required for digital transformation. In the past decade, disruptive digital technologies, unexpected consumer behaviors, and disruptive competition have accelerated an unprecedented level of change for incumbents. To address these rapidly changing environmental conditions, we develop a process model that identifies nine digitally based microfoundations (e.g., subcapabilities) that underpin the building of *digital sensing*, *digital seizing*, and *digital transforming* capabilities. Echoing Velu's (2017) research, we report on several capabilities that, in isolation, could apply to nondigital-based change, but as a system of capabilities, reflect the industry's current view of what types of dynamic capabilities are needed to pursue a digital transformation.

In contrast to nondigital-based strategic change, we argue that the ubiquity of new digital technologies is changing the very nature and purpose of dynamic capabilities. First, we found new digital technologies such as blockchain, cloud, and IoT platforms are changing the nature of dynamic capabilities because organizations can now scale up or scale down their operations at a speed, ease, and cost that was not possible only a decade ago. Second, the convergence and generativity of these pervasive digital technologies means that the purpose of building dynamic capabilities is now paramount for a wider range of organizations. In line with recent research (Autio et al., 2018), we found that digitalization is forcing incumbent firms to be more entrepreneurial when given the strategic imperative to build a system of

digital capabilities that address the unprecedented threats associated with the decoupling and disintermediation of existing value chains.

We report that digital sensing consists of subcapabilities relating to (1) digital scouting, (2) digital scenario planning, and (3) digital mindset crafting. Digital sensing capabilities advance the existing research on dynamic capabilities because we found evidence of incumbents using disruptive technologies, such as artificial intelligence, analytics, and IoT platforms, to make sense of big data that were previously hidden. We found that digital seizing consists of subcapabilities relating to (1) strategic agility, (2) rapid prototyping, and (3) balancing digital portfolios. Given the disruptive nature of digitalization, we found that incumbents are experimenting with entrepreneurial methods to build digital seizing capabilities that strengthen strategic agility for rapid responses to unexpected opportunities and threats. As a result, we argue that given their potential to shorten new product launches, maximize customer centricity, and rapidly scale at a marginally negligible cost, new digital technologies such as cloud computing and social media are changing the very nature of seizing capabilities.

Digital transforming capabilities consists of microfoundations relating to (1) navigating innovation ecosystems, (2) redesigning internal structures, and (3) improving digital maturity. For incumbents, we found that the core purpose of digital transforming capabilities is to manage a wide range of tensions that relate to balancing internal and external collaboration, redesigning flexible and manageable governance structures, and improving the digital maturity of an externally recruited and internally promoted workforce. Therefore, our findings on digital transforming capabilities emphasize the need for digital technologies that provide rapid responses to technological and market change (Eisenhardt and Martin, 2000; Teece et al., 1997). Overall, we therefore contribute to Peteraf et al.'s (2013) call for contingency-based research to help theoretically and empirically integrate the dynamic capabilities field, and in doing so, we provide new insights into digital transformation as a context for strategic change.

Theoretical Overview

Why digital technology is changing strategizing

To explain why digital technology is changing the nature of strategizing, we focus on the digital innovation perspective, which has its roots in the information systems (IS) literature (Nambisan et al.,

2017; Tilson et al., 2010; Yoo et al., 2010). Over the past two decades, IS scholars have examined the role of digital technology on firms' strategies (Bharadwaj et al., 2013; Hess et al., 2016; Sambamurthy et al., 2003;), innovation (Henfridsson et al., 2014; Yoo et al., 2012), and business models (Al-Debei and Avison, 2010; El Sawy and Pereira, 2013; Timmers, 1998) by explaining their disruptive impact on organizations. In Table 1, we start by defining the key digital concepts and introduce why new and pervasive digital technologies are changing the very nature of strategizing.

[Insert Table 1 about here]

Yoo et al. (2012: 1398) explain that “a defining characteristic of pervasive digital technology is the incorporation of digital capabilities into objects that previously had pure physical materiality.” Digital innovation is said to stem from the digitization of everyday physical products—such as adding software applications to books, clothing, home appliances, cars, and so forth—providing novel functions that dramatically improve product design, production, distribution, and use (Yoo et al., 2010). Moreover, Yoo et al. (2010) explain how the unique characteristics of digital innovation are rooted in the (1) reprogrammability, (2) data homogenization, and (3) self-referential nature of digital technology. Therefore, digital technologies with these three characteristics pave the way for a layered modular architecture that creates opportunities for embedding digital components into physical products, representing a strategic choice for firms seeking digital innovation (Yoo et al., 2010). Notably, the organizing logic of the layered modular architectures of digital technologies is that digitized products can simultaneously be a product and platform—for example, Apple's iPad and Amazon's Kindle—which results in strategic choices at different layers because two firms can compete on one layer, such as devices, and collaborate on other layers, such as content or services (Henfridsson et al., 2014; Yoo et al., 2010).

This means a layered modular architecture is a hybrid technology that embeds the layered architecture of digital technology into the modular architecture of a physical product, which can generate profound changes in a firm's organizing logic and innovation (Yoo et al., 2010). The sheer reprogrammability and data homogenization of digital technologies has enabled the *convergence* and *generativity* of digital innovations that have led to new products, services, business models, strategies, and organizational forms (Autio et al., 2018; Tilson et al., 2010; Yoo et al., 2010). For strategy

researchers and practitioners, the convergence and generativity of digital technologies are apparent in the form of three distinct yet related elements: — (1) digital artifacts, (2) digital platforms, and (3) digital infrastructures (Nambisan, 2017) —which we define in Table 1.

First, because digital artifacts such as the software or hardware components on a physical device are programmable, addressable, sensible, communicable, memorable, traceable, and associable (Yoo, 2010), this enables the separation of form and function, where new functionalities can be rapidly added to a wide range of digital products at a marginally negligible cost (Huang et al., 2017). Second, digital platforms (and associated ecosystems) are often orchestrated by platform leaders (e.g., Apple iOS or Google Android), meaning outsider firms face tough strategic choices about joining or building platforms, both of which contain risks and unintended consequences (Dattée et al., 2018; Nambisan et al., 2017; Zahra and Nambisan, 2012). Third, digital infrastructures such as social media, data analytics, cloud computing, and 3D printing have provided young digital firms with new tools for rapid scaling (Huang et al., 2017) and accelerating rapid multinationalization (Monaghan and Tippmann, 2018). In recent years, “born digital” pioneers such as Google, Amazon, and Facebook have grown to become powerful “behemoths” and created a “new generation of competition” that has put the survival of incumbent firms under threat (Sebastian et al., 2017; Teece and Linden, 2017)

A defining characteristic of the above digital enterprises is that they have deeply engaged and accelerated the process of digitalization. In Weiser’s (1991: 94) seminal article, he introduces ubiquitous computing as an environment where “the most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it.” A decade later, Lyytinen and Yoo (2002) were predicting that ubiquitous computing would proliferate as mobile computing integrates with pervasive computing, which has the capability to embed our natural movements and interactions with our environments—both physically and socially. Since then, digitalization has been reported to form the basis of everyday experiential computing (Yoo, 2010) and is regarded as a sociotechnical process (Tilson et al., 2010) that involves using advances in digital infrastructures to analyze, interpret, and shape changes in social, institutional, and increasingly cognitive contexts. This has meant digitalization is increasingly viewed as an

entrepreneurial process (Autio et al., 2018; Henfridsson and Yoo, 2013; Huang et al., 2017; Nambisan, 2017), where new business model innovations have eroded incumbent advantages and resulted in the world's most valuable and/or fastest growing companies, as shown in Table 1.

Digital transformation of incumbent firms

The digital transformation of big and old firms has become a strategic imperative on leadership agendas to protect incumbent advantages in traditional industries (Berman, 2012; Fitzgerald et al., 2013; Gray et al., 2013; Hess et al., 2017; Sebastian et al., 2017; Svahn et al., 2017). Digital transformation differs from the traditional forms of strategic change on the basis that digital technologies have accelerated the speed of change, resulting in much more environmental volatility, complexity, and uncertainty (Matt et al., 2015; Loonam et al., 2018). Hess et al. (2017: 124) explain that a digital transformation must consider how advances in digital technologies can bring about changes in a company's business model, organizational structures, and processes. However, as Sebastian et al. (2017: 198) report, "Most leaders of big old companies believe their companies can retain leadership positions by taking advantage of both their existing strengths and the capabilities offered by digital technologies"; and later add, this is without fully appreciating the strategic challenges of digital transformation.

Digitalization has opened a wide range of possibilities for firms to interact with customers, which has led to new and unexpected business model innovations (Amit and Zott, 2001; Aspara et al., 2013; Chesbrough, 2010; Khanagha et al., 2014; Wirtz et al., 2010). Magretta (2002: 89) highlights that the term "business model" came into widespread use in the 1990s with the advent of personal computers and spreadsheets because strategic planners were then able to test a wide range of assumptions to predict the profitability of generating new revenue streams and changing cost structures. This has meant the "business model" particularly in a digital context has become a new unit of analysis (Zott et al., 2011) that examines how a firm creates and delivers value to its customers and captures profits from managing a system of networked activities (Amit and Zott, 2012; Zott and Amit, 2010). Velu (2017: 605) emphasizes that this system of activities "need[s] to be aligned with one another in order to develop an efficient mechanism to create superior performance for the firm while delivering value for the customer." As a result, Teece (2018: 40) notes that a business model

“describes an architecture for a how a firm creates and delivers value to customers, and mechanisms employed to capture a share of that value. It’s a matched set of elements encompassing the flows of costs, revenues and profits.”

In Zott et al.’s (2011) review of the business model literature, the authors report that the study of *e-business*—involving e-commerce, e-markets, and Internet-based businesses where buyers and/or suppliers conduct commercial transactions over the Internet—has attracted the most research attention. Conversely, digitalization has empowered customers with more choice, expectations, and demands, which has forced firms to reevaluate or supplement traditional transactional customer value propositions with new relational or multidimensional value propositions¹ (Aversa et al., 2017; Baden-Fuller and Haefliger, 2013; Casadesus-Masanell and Ricart, 2010; Teece, 2010; Weill and Woerner, 2013). Therefore, pervasive digital technologies challenge the logic of traditional business models because growing customer expectations for free products or services often hinder the capacity to generate revenues and earn profits (El Sawy and Pereria, 2013; Iansiti and Lakhani, 2014; McGrath, 2010; Teece, 2010). In response to these customer demands, Teece and Linden (2017) emphasize that many Internet-based businesses have tended to pursue customer growth (i.e., value creation) ahead of profits (i.e., value capture), often resulting in flawed business models with unclear paths to profitability.

Hence, incumbent firms pursuing digital transformation are likely to encounter significant barriers for business model innovation (Aspara et al., 2013; Berman, 2012; Demil and Lecocq, 2010; Iansiti and Lakhani, 2014; Kim and Min, 2015; Markides, 2006; Nylén and Holmström, 2015; Velu and Stiles, 2013; Weill and Woerner, 2015). In Foss and Saebi’s (2017: 201) systematic review of the business model innovation (BMI) literature, they report that Teece’s (2010: 172) definition of a business model as the “design or architecture of the value creation, delivery and capture mechanisms” of a firm is widely adopted, whereas consensus on *business model innovation* is less well understood. Relatedly, Foss and Saebi (2018) report that the BMI literature includes numerous definitions

¹ Baden-Fuller and his colleagues have established the Business Model Zoo™ (www.businessmodelzoo.com), an online resource that provides case overviews of different business model pathways for developing a business.

associated with *business model dynamics or change*, such as business model “learning” (Teece, 2010), “evolution” (Demil and Lecocq, 2010; Velu, 2017), “replication” (Dunford et al., 2010) “reconfiguration” (Calia et al., 2007), “renewal” (Doz and Kosonen, 2010), “transformation” (Aspara et al., 2013), and “innovation” (Chesbrough, 2010; Khanagha et al., 2014). A common thread connecting the BMI literature is incumbents facing a range of *tensions* between traditional and new ways of working (Chesbrough, 2010). This means that leaders face the “strategic paradox” of having to find new ways to balance the contradictory demands of managing complex business models that are likely to change over time (Smith et al., 2010; Velu and Stiles, 2013).

A major barrier incumbents face with changing business models is that managers are often unwilling to experiment with new business model archetypes (Amit and Zott, 2001; Chesbrough, 2010; Ritter and Lettl, 2018; Sosna et al., 2010). Baden-Fuller and Morgan (2010) note business model archetypes describe well-known business logics that explain value creation, delivery, and capture mechanisms across industry contexts. For incumbents, the root of this tension is that managers are likely to favor established models with higher gross margins and use rules, norms, and metrics (e.g., gross margins must be at 40%) to protect the status quo and resist experiments that might threaten the profitability of existing business models (Chesbrough, 2010; Johnson et al., 2008). For example, the wide adoption of product business models is often a major barrier that hinders experimentation with other business model archetypes. These archetypes include “servitization” (e.g., Rolls Royce power by the hour), “bundling” (e.g., Gillette's razor and blade), “subscription” (e.g., Netflix's monthly rental fee), and “matchmaking” (e.g., eBay's online marketplace) models that have been replicated across industries (Aversa et al., 2017; Martinez et al., 2017, McGrath, 2010; Teece, 2010; Ritter and Lettl, 2017).

Digitalization is reported to provide a source of experimentation for incumbents that seek to “reinvent” their business model (Westerman et al., 2014; Westerman and Bonnet, 2015). Westerman et al. (2014: 78-92) explain that digital technology has driven five broad archetypes of business model reinvention: (1) reinventing industries (e.g., Uber’s reshaping of the industry structure); (2) substituting products and services (e.g., Amazon’s Kindle substitution of physical books); (3) creating new digital businesses (e.g., Nike+ *Sensor* connectivity to Apple devices); (4) reconfiguring value

delivery models (e.g., Volvo's embedding of digital artifacts into cars); and (5) rethinking value propositions (e.g., Entravision's advanced use of data analytics to target unmet customer needs). Overall, this shows that incumbents face the tension of balancing existing performance with new learning, which is a significant barrier for business model adaptation (Itami and Nishino, 2010).

Path dependencies are major barriers for business model transformation, meaning established business models can become inert and erode over time (Cavalcante et al., 2011; Doz and Kosonen, 2010; McGrath, 2010). Laudien and Daxböck (2016) argue that path-breaking mechanisms such as exogenous and endogenous shocks are often needed to trigger changes in traditional product-based logics. However, for most incumbents, the creation of new disruptive business models is unlikely because they are more likely to use digital technologies to extend, revise, or terminate existing activities in an evolutionary manner (Cavalcante et al., 2011; Foss and Saebi, 2018; Kim and Min, 2015). Because the digital transformation of an incumbent's business model is a highly complex change process that combines the corporation's business model and the business models of its various business units, research has shown this requires a series of calculated and interdependent strategic decisions (Aspara et al., 2013; Velu and Stiles, 2013).

To reduce complexity, Laudien and Daxböck (2016) note that managers tend to make use of prior experience, favoring strategic choices they are familiar with (Gavetti and Levinthal 2000) over unfamiliar options that could achieve transformational change. Here, "managing the mismatch" between the new economic reality and managers' existing cognitive perceptions of old established business models is often a challenge (Velu, 2017: 605). For example, Weill and Woerner (2013: 71-72) emphasize that a digital business model challenges a physical model in three main areas: (1) internal power, where the "owner" of the customer's experience often changes, requiring a business unit to manage multiproduct customer experiences; (2) business processes, which require seamless integration across channels; and (3) customer data, which become an enterprise-wide resource. Weill and Woerner (2015) therefore argue that incumbents are less likely to adopt a digital business model compared with smaller, younger enterprises because of the economic and cognitive path dependencies brought about by legacy systems, global operations, work silos, and organizational politics.

Senior leadership teams without digitalization experience are another significant barrier for business model transformation (El Sawy et al., 2016). Bouchikhi and Kimberly (2003) note that senior leaders often struggle to radically transform the organization's business model when these teams fail to escape the "identity trap" that intimately ties the organization's core competence to its values, history, collective memory, politics, habits, and emotions; the authors note that Polaroid's failure to escape its "instant photography" identity despite the digitalization of the imaging industry illustrates the urgency for a responsive leadership team. Interestingly, Doz and Kosonen (2010) propose a wide repertoire of concrete actions senior leaders can take regarding (1) heightening strategic sensitivity, (2) fostering leadership unity, and (3) making resources more fluid for embedding strategic agility into large organizations to accelerate the renewal and transformation of business models.

The management of conflicting demands is another major barrier for the transformation of complex business models (Smith et al., 2010; Svahn et al., 2017; Velu and Stiles, 2013). Smith et al. (2010) emphasize that the contradictions and tensions inherent in complex business models exert significant pressures on senior leaders and their teams, requiring a significant range of capabilities to manage conflicting demands. This includes being able to balance agility and stability (Doz and Kosonen, 2010), capture profits from investments in previous learning (Itami and Nishino, 2010), and ensuring there is "dynamic consistency" for business model evolution (Demil and Lecocq, 2010). Interestingly, research has shown that senior leaders have used a staged approach to balance the procedural rationality and politics of strategic decision making for resolving the paradoxes of running an established and new disruptive business model in parallel (Velu and Stiles, 2013). Relatedly, Velu (2017: 606) emphasizes that firms need dynamic capabilities to carefully achieve a balance between the efficiency and flexibility required to ensure business model evolution. However, research on the dynamic capabilities for digital transformation is still at a nascent stage.

Building dynamic capabilities for digital transformation

The dynamic capabilities framework provides a powerful lens for studying strategic change in organizations (Barreto, 2010; Peteraf et al., 2013; Schilke et al., 2018). Dynamic capabilities describe a company's 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" (Teece, 2007: 1319). Dynamic capabilities are innovation based and distinguishable from a firm's operational capabilities (Ambrosini and Bowman, 2009; Helfat and Winter, 2011; Pavlou and El Sawy, 2011; Teece, 2014; Zahra et al., 2006). Helfat and Winter (2011: 1244) note that operational capabilities are ordinary in the sense they help a firm in the present by maintaining the *status quo*, but this leaves the firm vulnerable to environmental change.

Teece (2014:18-19) explains that although ordinary capabilities enable the firm to perform operational tasks, ordinary capabilities in functions such as accounting, human resources management, and sales are now easily replicable because they can be outsourced to the "cloud" and no longer support a durable competitive advantage. In contrast, dynamic capabilities govern the rate of change in a firm's ordinary capabilities (Teece, 2007), are harder to replicate (Teece, 2014), and support evolutionary fitness (Helfat et al., 2007), enabling a firm to *alter* "how it currently makes a living" (Helfat and Winter, 2011: 1244). Teece and Leih (2016: 7) stress that dynamic capabilities must be built rather than bought because "ordinary capabilities are about doing things right, dynamic capabilities are about doing the right things."

The literature clarifies the relationship between dynamic capabilities, strategy, and business models (Achtenhagen et al., 2013; DaSilva and Trkman, 2014; Teece, 2018; Velu, 2017). In advancing Casadesus-Masanell and Ricart's (2010:195) argument that a business model is "a *reflection of the firm's realized strategy*," DaSilva and Trkman (2014: 383) argue that "strategy is about building dynamic capabilities aimed at responding efficiently to future and existing contingencies." The authors argue the following:

Strategy (a long-term perspective) sets up dynamic capabilities (a medium-term perspective) which then constrain possible business models (present or short-term perspective) to face either upcoming or existing contingencies. Thus, strategy entails devising dynamic capabilities able to respond to contingencies through the organization's business model. Business models are then bounded by the firm's dynamic capabilities. (p. 383)

Given that “every organization has a business model [...but] not every organization has a strategy,” it is apparent that strategy is a contingent plan of the competitive action on which business model to use (Casadesus-Masanell and Ricart, 2010: 200-203). In other words, dynamic capabilities represent the intermediary between strategy and business models, ensuring the strategic renewal of organizations (Agarwal and Helfat, 2009). Velu (2017) emphasizes that firms require a system of dynamic capabilities to orchestrate resources and evolve the business model. Velu (2017) finds that (1) balanced redundancy, (2) requisite variety, and (3) cognitive discretion were the dynamic capabilities that supported the evolution of a new firm’s digital business model. For incumbent firms, Teece (2018: 44) argues, “In many cases corporate strategy dictates business model design. At times however, the arrival of a new general-purpose technology (e.g., the Internet) opens opportunities for radically new business models to which corporate strategy must then respond.” Building sensing, seizing, and transforming capabilities thus allows a firm to craft future strategy that designs, creates, and refines a defensible business model, guides organizational transformation, and provides a durable source for obtaining a competitive advantage (Teece, 2018).

a) sensing capabilities

Incumbents require sensing capabilities to scan the external environment for unexpected trends that could disrupt the organization (Birkinshaw et al., 2016; Day and Schoemaker, 2016; Dong et al., 2016; Giudici et al., 2018; Helfat and Raubitschek, 2018; Loebbecke and Picot, 2015). Teece (2007: 1322) notes that “sensing (and shaping) new opportunities [and threats] is very much a scanning, creation, learning, and interpretative activity” that analyzes diverse information about trends in the business ecosystem. Therefore, sensing should take place at all levels of the organization, with lower levels helping to provide information about and insights into external trends to middle and top managers (Teece and Linden, 2017).

However, incumbents face significant challenges in building sensing capabilities that can predict the latest digitalization trends (El Sawy et al., 2016; Fitzgerald et al., 2013; Hansen and Sia, 2015; Matt et al., 2015). Yoo et al. (2012) explain that building platforms of digital capabilities rather than single products places reliance on complementors to distribute innovation, which increases the risk of systematic failures and unintended consequences. The convergence of bringing unconnected

user experiences and unconnected industries together through platforms of “smart products,” for example, have resulted in new business model innovations that have been very difficult for incumbents to predict (Sebastian et al., 2017). Conversely, Yoo et al. (2012) argue that generativity has produced digital innovations that exceed original design intents and resulted in products that competitors, consumers, and even the original innovator did not expect because various actors tend to pursue their own strategies.

Dynamic managerial capabilities (Helfat and Peteraf, 2015) and business units dedicated to scenario planning (Helfat and Raubitschek, 2018; Teece et al., 2016) are important for sensing unexpected trends, but both have analytical limits. This is apparent in a “big” or “smart” data context, where organizations are using digital infrastructures such as IoT platforms to collect and analyze large-scale and real-time granular data to predict and capitalize on human behavior (George et al., 2014; Ross et al., 2017). Given the advances in computational speed, data storage, data retrieval, sensors, and algorithms, this has dramatically reduced the cost of machine-learning-based predictions, meaning some firms are turning to artificial intelligence to anticipate new trends and circumvent cognitive limits (Agrawal et al., 2017). However, Agrawal et al. (2017: 26) stress the following:

The key [AI] challenges for executives will be (1) shifting the training of employees from a focus on prediction-related skills to judgment-related ones; (2) assessing the rate and direction of the adoption of AI technologies to properly time the shifting of workforce training (not too early, yet not too late); and (3) developing management processes that build the most effective teams of judgment focused humans and prediction-focused AI agents.

Dong et al. (2016) argue firms need to build *generative sensing* capabilities that use technologies to generate and test multiple hypotheses in an abductive way to help managers explain surprising or anomalous events and judge the impact of unexpected trends. Relatedly, some studies report that firms in pursuit of digital innovation require sensing capabilities in *digital evolution scanning* to gather information through new digital devices, channels (e.g., software platforms, operating systems, and web services), and emerging user behaviors across contexts and markets (Nylén and Holmström, 2015). Here, sensing capabilities do not reside exclusively inside firms but can be co-created relationally with other parties in the business ecosystem (Giudici et al., 2018). Teece (2018: 45)

highlights, “It takes time for business model innovation to catch up with technological possibilities, perhaps because business models are more context-dependent than technology,” which heightens the urgency for building seizing capabilities.

b) seizing capabilities

To address opportunities or neutralize threats, incumbents require seizing capabilities that ensure leaders avoid hubris, deception, bias, and delusion and that allow firms to experiment with decentralized boundaries, digital platforms, and new business models (Teece, 2007). Day and Schoemaker (2016) report that “seizing” is an experimental capability that supports action and commitment by using techniques such as rapid prototyping and real options logic to effectively balance risk and reward. Digitalization has encouraged entrepreneurial firms to seize opportunities by experimenting with the (1) decoupling (i.e., regulating asset specificity of power relationships), (2) disintermediation (i.e., reducing the power of established intermediaries), and (3) the generativity (i.e., unprompted innovative outputs) of existing value chains, which has created radical business model innovations (Autio et al., 2018). However, Teece (2007: 1327) notes even if an incumbent enterprise senses an opportunity, one should not be surprised if it fails to invest in this opportunity because path dependencies “tend to eschew radical competency-destroying innovation, in favor of more incremental competency-enhancing improvements.” To overcome such inertia, incumbents in traditional industries are starting to experiment with agility—originally a software methodology—to seize new opportunities, but execution is more difficult and less transferable in practice (Birkinshaw, 2018; Sambamurthy et al., 2003; Pavlou and El Sawy, 2010; Rigby et al., 2016; Weber and Tarba, 2014).

Teece et al. (2016: 17) define agility as “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.” Sambamurthy et al. (2003) propose that firms should use information technology (IT) infrastructures to build three interrelated capabilities consisting of (1) customer agility (e.g., co-creating user experiences), (2) partnering agility (e.g., orchestrating an ecosystem of external partners), and (3) operational agility (e.g., achieving speed, accuracy, and cost efficiency) to enhance financial performance. Indeed, the

building of IT leveraging competencies has been reported to enable a variety of agile responses, ranging from complex moves such as embarking on new corporate ventures for new product development to simple moves such as adjusting existing production processes and resource utilization (Overby et al., 2006; Pavlou and El Sawy, 2006). Rigby et al. (2016) note this has meant agile methods are now spreading beyond IT to other functions and industry contexts, yet incumbent projects tend to be ineffective because leaders fail to understand the conditions on which agile does or does not work; this indicates flexible sourcing arrangements, building organizational slack, and adopting open innovation processes are ways to preserve and enhance agility (Teece et al., 2016). However, for incumbents, real agile action tends to require a deeper and broader digital transformation (Birkinshaw, 2018; Hess et al., 2016; Sebastian et al., 2017; Svahn et al., 2017).

c) transforming capabilities

Sensing and seizing capabilities help create and discover opportunities, but to execute a digital strategy, firms need transforming capabilities to realize the full potential of strategic change (Bharadwaj et al., 2013; Karimi and Walter, 2015; Teece and Linden, 2017). Day and Schoemaker (2016: 65) report that an organization with “transforming capabilities is one where agile, entrepreneurial mindset is actively cultivated within, with a broad expansive approach to external network-building as well.” Thus, transforming capabilities supports incumbents with the continuous strategic renewal of assets and organizational structures to ensure responsiveness in fast-changing environments (Agarwal and Helfat, 2009; Teece, 2014).

However, Svahn et al. (2017) report that digital transformation is more challenging because incumbents face four broad competing concerns, even if they are willing to embrace digital innovation. Incumbents must try to *balance* (1) building innovation capabilities alongside existing product innovation practices; (2) process and product innovations; (3) collaborative tensions between employees and external partners; and (4) governance structures that ensure flexibility and control (Svahn et al., 2017: 239-240). Most incumbents’ digital transformations are hence still at an early stage because most revenues derive from traditional products and services (Sebastian et al., 2017). Therefore, incumbents need to craft digital strategies that leverage digital technologies for rapid innovation and responsiveness to inspire new value propositions and operational excellence (Hess et

al., 2017;). However, understanding how organizations build dynamic capabilities for digital transformation is a paramount strategic question that is yet to be fully understood, providing the research focus for the remainder of the current study.

Research Methodology

Research design and context

Our research design is based on multiple case studies that examine how incumbent firms in traditional industries build dynamic capabilities for digital transformation (Eisenhardt and Graebner, 2007). As a participant in digital strategy consultancy projects, the second author observed that industry-wide views on the term “digital transformation” are diverse, and the term is often used as a buzzword to represent various strategizing and organizing activities. Therefore, we used qualitative methods to collect and analyze a broad scope of data to make sense of digital transformation; we took a novel approach by drawing on senior executives’ experiences with leading digitalization projects in a wide range of industry contexts (Pettigrew, 1987). We started gathering insights from the senior partners of German multinational corporation (MNC) subsidiaries in the global strategy consulting industry, each of whom had substantial knowledge and experience with guiding client firms with digital transformation (Klarner et al., 2013). As our research project unfolded, we analyzed several incumbent firms located in Germany that are undergoing a digital transformation across a wide range of industries. Table 2 presents our purposeful sample and allocates pseudonyms to maintain the confidentiality of each participating firm. All experts— with at least five years of senior leadership experience and being well educated—shared the important characteristic of being senior executives. Their human capital represents their deep knowledge of, and experience with digital transformation (Helfat and Peteraf, 2015).

[Insert Table 2 about here]

Data collection

Over a 21-month period, we collected a wide range of data, including observation, semistructured interviews, and industry documents. At the start of the research project, the second author worked as a trainee consultant at one of the case consultancies (Digitize Ltd.) from October 2016 to December 2016. This internship role provided opportunities to interact with senior consultants who had digitalization

experience and gain access to MNCs that are incumbent firms undergoing digital transformation. Following this experience, we collected and analyzed 17 strategy consultancy reports on digital transformation. Each report ranged between six and 96 pages and was published between 2013 and 2016. As a novel approach, we then contacted the authors of the strategy consultancy reports when possible (five of nine senior consultants) and requested interviews to discuss the findings in more detail. The managing partners from each strategy consultancy agreed to participate in the research.

Face-to-face interviews were chosen to collect data and enable personal contact (Alvesson, 2003), and they took place in June and July 2017. In the interviews, we asked the senior consultants to share their personal views of and lived experiences with digital transformation. To guide the discussion, we introduced the participants to a practitioner conceptualization of the dynamic capabilities framework (Day and Schoemaker, 2016: 60); this interactive exercise provided participants with the opportunity to use the dynamic capabilities framework to openly discuss their knowledge of and experiences with guiding client firms through a digital transformation. After a preliminary analysis of the consultant interviews, we returned to the field and conducted repeat interviews with the same senior executives of incumbent firms in Germany between August 2017 and January 2018. By this point, we had started to develop a process model and asked participants to apply our model to obtain a breadth of contextuality on digital transformation across automotive, banking, manufacturing, and telecommunications industries. This interactive exercise was useful for refining our model and identifying which types of dynamic capabilities are built for digital transformation.

As a last step of data collection, we collected all publicly available annual reports and recent news reports on each firm's digital transformation. We then triangulated our findings by conducting two more interviews in April 2018 with the founding partners of Navigate Ltd.—a boutique digital strategy consultancy—which has extensive experience working on digitalization projects with our purposeful sample of incumbent firms. In these two interviews, the senior partners agreed with the representation of our case findings and offered new snowball sampling opportunities to connect with another three senior digital directors of incumbents in the media, energy, and automotive industries. Therefore, this further data collection allowed us to triangulate our findings by asking the participants to use our process model

and verify the reliability of our case findings. The interviews ranged from 30 minutes to two hours and were tape-recorded and transcribed.

Data analysis

Our data analysis was focused on making sense of digital transformation (Gioia et al., 2013). Our participant observation triggered this sensemaking and led to a finer qualitative analysis, which allowed us to explore the microfoundations of building dynamic capabilities for digital transformation. By initially conducting a summative content analysis (Hsieh and Shannon, 2005; Schreier, 2014) of strategy consultancy reports, we identified the broad inconsistencies on what digital transformation really means and the ambiguities centering on the processes and outcomes. The interviews with the senior consultants allowed us to discuss these inconsistencies and clarify how they guide MNC problem solving regarding digital transformation (Gioia et al., 2013; Tippmann et al., 2012). A summative content analysis involves “counting and comparisons, usually of keywords or content, followed by the interpretation of the underlying context” (Hsieh and Shannon, 2005: 1277); this analytical process was particularly effective because the reports provided a breadth of understanding for sensemaking, which subsequently allowed us to direct our analysis and interpretation of the interviews to topics that required a deeper explanation.

We used NVivo© 11 software to identify the in-case conceptual patterns across the primary and secondary data through coding and organizing the data into fragments (Miles and Huberman, 1994). Second, we aggregated the in-case similarities and differences into broader categories through data reduction (Miles and Huberman, 1994). Based on this aggregation and data reduction in Appendix 1, we conducted the cross-case analysis in the third step to look for similarities and differences across the cases (Eisenhardt and Graebner, 2007). We derived first-order concepts representing strategic activities and directly connecting to the overarching dimensions of the dynamic capabilities framework. We combined similar first-order concepts across cases into a set of second-order themes (Gioia et al., 2013). Finally, we triangulated the second-order themes and first-order concepts with supplementary interviews to strengthen the contextuality of our process model.

Figure 1 represents our final data structure. The data structure not only helps to configure the data into a sensible visual aid, but it also represents a graphic illustration of our analysis from raw data to

concepts and themes (Gioia et al., 2013). The final data structure in Figure 1 summarizes the interrelations of first-order concepts, second-order themes, and aggregate dimensions on which we propose a process model. The first-order concepts incorporate the language of the participants and describe the key activities for digital transformation. Finally, we developed aggregate dimensions from the second-order themes that represent capability microfoundations, along with the contextual factors that relate to the triggers, enablers, and barriers of building dynamic capabilities for digital transformation.

[Insert Figure 1 about here]

Emergent Findings

Making sense of digital transformation

Early on in our research project, it was evident that the participants had different perspectives on what digital transformation represents and entails. This was apparent by the fact that the senior strategy consultants used different terminology to discuss a wide range of themes relating to how incumbents build new awareness, preparedness, and responsiveness to address the “digital revolution” (Connect-Q-1) or “digital age” (Seize-Q-1) context. For example, one consultant felt the meaning of digital transformation can vary from an organizational and individual perspective:

I will start with our consultancy’s view on digital transformation: It is the reaction to the digital revolution. We support our clients in order to react faster in rapid changing environments. As you know, our consultancy is very technology oriented, which means that our approach to digital transformation is also oriented toward tools, technologies, processes, and how do we make a company more digital.

My personal definition is a little bit different. I am personally not a digital person, I don’t use Facebook or Twitter. For me, it is more a mindset. Digital transformation for me means that I have to react faster, to be flexible and agile, and to broaden my perspective. The most important thing is to take more things into account and to react to these trends. (Connect-Q-1)

In addition to technology adoption, the above quotation indicates that digital transformation also consists of a cultural orientation (e.g., a specific mindset) that recognizes the importance of fast and flexible decision making for competing in an uncertain context. Awareness of advances in digital technologies and preparedness for changes in consumer behaviors were also common themes within our data. As another consultant put it:

Digital transformation is not about technology or about acquiring new technological skills. It is in fact about getting new awareness and bringing new ideas on how to think and how to act into a

classical organization. [...] So improving in the tactical or implementation skill set on how fast, how customer centric, how agile these decisions are put into practice. (Redesign-Q-1)

In addition to these points, the digital transformation of an incumbent's business model was another prominent theme. For example, another consultant discussed helping incumbents design new business models by identifying new forms of vertical and horizontal collaboration while involving a wider ecosystem of external partners (Balance-Q-1). Interestingly, digital transformation was also described as a capability-building process, as another consultant summarized:

Digital transformation describes a journey of a company trying to be equipped for the digital age [...]. I believe there are different capabilities needed to survive and succeed as a company in the digital age. Building and deploying these capabilities means digital transformation for me. (Seize-Q-1)

Building dynamic capabilities for digital transformation: A process model

In this section, we present a process model that explains how incumbents build dynamic capabilities for digital transformation. Our model, as shown in Figure 2, is grounded in senior executives' experiences with leading digital transformation projects. The starting point of our model is represented by external triggers, including disruptive digital competitors, changing consumer behaviors, and disruptive digital technologies, which trigger the building of dynamic capabilities for digital transformation. Our model specifies three core enablers—cross-functional teams, fast decision making, and executive support—along with three core barriers—rigid strategic planning, change resistances, and a high level of hierarchy, which influence the building of dynamic capabilities for digital transformation.

[Insert Figure 2 about here]

a) building digital sensing capabilities

When presenting the “sensing cluster,” all participants highlighted that advances in digital technologies now challenge the traditional approach to strategizing. All consultants spoke about the need to develop new capabilities in *digital scenario planning* and *digital scouting* to pinpoint new technological, customer, and competitor-based trends. All consultants talked about the use of informal and formal networks in the world's technology hubs to identify technological trends; they also emphasized the importance of big data analytics and artificial intelligence to sense new customer-centric trends that are hard for strategic planners to predict. As one senior partner put it:

At no single time in the past, either in the industrial revolution or the revolution with the first computers, nothing has changed so fundamentally in such a short time. In the past, the products, customers, and sales channels remained the same. Now, you are in a situation where customers basically change. [...] At the same time, you have new competitors moving in, who are entirely new. Let's take the automotive sector, where competitors were absolutely known by the firms. The incumbents knew exactly what the rivals will do in some years. Now, you have a Tesla with a different product, totally different processes, so it is totally unpredictable. (Build-Q-1)

To build sensing capabilities in *digital scouting* and *digital scenario planning*, a common theme across all interviews and industry reports was that capability development is contingent on *digital mindset crafting*. All senior consultants emphasized that strategizing in a digital context must be based on crafting a strong digitally oriented culture. They talked about the importance of establishing a long-term digital vision while promoting an entrepreneurial and digital mindset within large established companies. As one consultant put it:

Firms can spend millions of dollars in their digital transformation, but if they don't have a digital vision, then nothing will actually change. (Connect-Q-2)

Within our consultancy data, *digital mindset crafting* was a prominent theme and was regarded by the consultants as an essential capability for starting an incumbent's digital transformation. As the managing director of a digital consultancy division explained:

You need to understand how exponential technologies evolve and translate that into what does it mean from economic value perspective for the business. You also need to understand what kind of people capabilities that will require. The promotion of a digital culture will accelerate the company's digital transformation. (Digitize-Q-1)

Our consultancy data raise three central issues that incumbents face in traditional industries for building sensing capabilities in the digital age. First, our data show that informal and formal scouting networks need to be incorporated into incumbent firms' formal strategic planning process. Second, our data indicate that traditional formal strategic planning mechanisms have yet to catch up with the advent of disruptive digital technologies, such as analytics and artificial intelligence, which can enhance strategic decision making. Third, our data show that crafting a digital mindset and culture throughout the entire organization is essential for building sensing capabilities that will allow incumbents to seize on the latest unexpected trends.

b) building digital seizing capabilities

When reviewing the "seizing cluster," the participants stressed that business model innovation was an essential component of an incumbent's digital transformation. The interviews and consultancy reports

reveal that the strategy consultancies often work with traditional organizations to incorporate *strategic agility* into their business model thinking to quickly exploit technological and market opportunities. For example, one senior consultant highlighted the central role of continuous redirection and speed in rapidly developing a client's digital business model:

You need the capability to implement or rather work toward such a target picture in a very agile way with fast and short sprints. And being willing and able to recalibrate your cores after these sprints. So it is all about being flexible, agile, dynamic. But at the same time understanding what is the bigger picture and underlying things that you will not change. (Build-Q-2)

To strengthen strategic agility, the consultants emphasized the importance of *rapid prototyping*, providing examples of recent strategic decisions to build “digital innovation labs” to experiment with minimum viable products. The consultants explained that digital innovation labs allowed incumbents to gather customer feedback in almost real time and use this feedback to respond to new customer-centric trends. As one consultant highlighted:

This is about the capability to really put things into practice very fast, to understand and elaborate on specific solutions, to scale up digital products to get something going. (Redesign-Q-2)

For *balancing digital portfolios*, the senior consultants emphasized that new business model innovations such as servitization or subscription models, must be balanced with existing product-based business models. The consultants explained that investments in digital infrastructures for rapid scaling, open innovation techniques, and technology acquisitions all help reach an appropriate speed of execution. For example, the managing director of a digital strategy boutique discussed the importance of using *digital scenario planning* capabilities to ensure that incumbents strengthen their *strategic agility* while *balancing digital portfolios* to enhance traditional product offerings:

Traditional strategic planning doesn't address the disruptions caused by digital technologies, changing consumer behaviors or economic volatility. Rather than tying corporate strategies on rigid three–five-year plans, you need to systematically manage critical uncertainties with scenario planning. You need several possible future scenarios and continuous iteration if you are to develop strategic agility in this unpredictable, digital environment. (Navigate-Q-1)

A prominent theme is that *strategic agility* is the critical dynamic capability for incumbents to seize on the latest trends and avoid potential existential threats. We found a consensus that incumbent firms must learn to specialize in pacing strategic actions and accept the reality that no firm can win every competitive race. In other words, constant redirection is likely to become commonplace for even the most traditional firms. Second, our consultancy data emphasize that dynamic capabilities in rapid prototyping

provide the opportunity to accelerate an incumbent's digital transformation. The consultants emphasized this requires decentralized innovation labs or new subsidiaries with a blank canvas to ensure ongoing *digital mindset crafting*. Third, our consultancy data show that *balancing digital portfolios* provide incumbents with the capability to scale up or down on business model innovations that have the potential to enhance existing customer needs and demands. Together, we found this system of capabilities represent the industries current view on what is required to seize on the latest digitalization opportunities.

c) *building digital transforming capabilities*

A discussion of the “transforming capabilities” cluster expectedly led to a rich discussion about digital transformation. The participants talked about a wide range of strategic issues relating to organizational culture, organizational redesign, and managing innovation ecosystems. For example, one consultant emphasized that *improving digital maturity* was essential for incumbents to pursue digital transformation:

It is really about thinking how do we get people to think about the same stuff with a different lens instead of thinking with the same lens about different things. Culture is so important in digital transformation, because if you don't get the cultural stuff right, if you don't get the wow effect, what are your agile processes helping with? When you compare LinkedIn profiles from Kaufhof [traditional German retailer] and Amazon managers, the job description may be the same, but they have a completely different understanding of how to interpret their job. (Redesign-Q-3)

To improve the digital maturity of the workforce, our data underscore the importance of involving younger “digital natives” in the capability-building process of traditional organizations. The senior consultants emphasized the need to strike a balance between improving the digital maturity of an externally appointed and internally promoted workforce. In the interviews, the participants talked about the challenges of building the capabilities for *redesigning internal structures* and argued that incumbents must build a leadership team, strategy, and business model that adopt a digital focus. For example, one participant drew on a recent digital consultancy project to illustrate the strategic leadership required to redesign management structures:

What was very interesting about our [automotive client] is they did not care about money. The senior management were more concerned about losing power and wanted to give decision-making power away. This highlights that digital transformation is also about culture and leadership change. The senior leaders realized it was essential to change the structure and the resources of the company. They didn't want financial or company boundaries issues, just a new [digital] mindset of the people. (Connect-Q-3)

The above quote implies that transformational leadership and decentralization are integral to renew strategies and business models. Interestingly, the participants talked about decentralization in the context

of *navigating innovation ecosystems*. This discussion included the need for traditional firms to build or join a digital ecosystem to work with new partners on “co-creation” and “co-opetition” activities, which help redefine the speed of collaborative behaviors and invent new business models. Moreover, “unlearning” existing practices was a common theme noted as an important skill for effectively interacting and collaborating with a wide range of new partners in digital ecosystems; this requires transformational leadership. One consultant emphasized the importance of leadership style for *navigating digital ecosystems*:

Maybe your ecosystem is changing every couple of years, maybe your platform has to be rebuilt four times within the next 15 years. And this is also why the leadership style becomes so decisive nowadays, it is driven not by hierarchy but by purpose. (Digitize-Q-2)

This system of capabilities provides insight into the wide range of complexities currently associated with digital transformation. What is clear from our data is that *improving digital maturity* of the workforce is a fundamental capability for the ongoing digital transformation of incumbent firms. Our findings highlight that incumbents must work toward *redesigning internal structures*, and this can be achieved through the decentralization of business units and establishment of independent subsidiaries. In addition, our data show that *navigating innovation ecosystems* can radically address customer needs compared with firms that maintain traditional product-based business models. These strategic activities help with *improving the digital maturity* of the workforce and support an incumbent’s ongoing digital transformation.

The digital transformation of incumbent firms—an ongoing process of strategic renewal

To gain deeper and broader insights into digital transformation, we interviewed senior executives of incumbent firms in a wide range of traditional industries facing disruptive competition. In these interviews, we asked the executives to apply our model as a tool to openly discuss each firm’s digital transformation journey. This helped us improve the contingency power of our model, provide as much context as possible, and verify the reliability of our findings. Table 3 outlines the strategic change of each incumbent firm, demonstrating that although each digital transformation is contextually unique, we found three broad forms relating to the strategic renewal of the firm’s business model, collaborative approach, and eventually the culture.

[Insert Table 3 about here]

Using Agarwal and Helfat's (2009) strategic renewal perspective, Table 3 shows that the scope of digital transformation varies because some firms have *refreshed* their traditional business models (e.g., Drive), while others have used digital technologies to *replace* their traditional operations with new collaborative approaches (e.g., Motion). In some cases, the ongoing strategic renewal of business models and collaborative approaches have *refreshed* traditional organizational cultures with a new digital mindsets and cultures (e.g., Balance and Media). Our findings reveal that digital transformation often starts with the strategic renewal of the incumbent's business model, and changes in business models tend to lead to wider changes in the firm's collaborative approach, which, if executed correctly, will eventually lead to deeper changes in organizational culture. As a result, our findings show that the *scope* of digital transformation varies on these three dimensions.

Table 4 provides the context for the unique digital transformation journey of each incumbent firm, as outlined in the following sections. In Table 4, we outline the major triggers, the scope of digital transformation, the main dynamic capabilities discussed, and the key successes of the existing digital initiatives. Our cross-case findings reveal that disruptive competition, changes in consumer demands, and advances in digital technologies are major triggers for strategic change, driving the creation of dynamic capabilities for digital transformation.

[Insert Table 4 about here]

Strategic renewal of business models

Table 4 shows that all the incumbents' digital transformations involved the strategic renewal of business models. In all cases, the incumbent firms had started to formulate strategies to renew established product-based business models with digitalization logics. This was intended to limit the reliance on transactional value propositions and capture value from new relational or multisided value propositions. The increasing threat of disruptive competition from new entrants in adjacent industries was a major trigger for the creation and delivery of new value propositions. However, our cross-case analysis shows that the incumbents built different types of dynamic capabilities for the strategic renewal of business models.

An interesting example of an incumbent firm that *refreshed* its business model is Drive AG—a global German automotive multiproduct manufacturer. Drive refreshed its traditional product business

model with a digitalization services logic. During interviews, the global head of digital strategy explained that Drive's digital transformation began at the end of the 1990s when SIM cards were integrated into cars to provide basic mobile connectivity. The participant told us that Drive's digital transformation has evolved considerably since then because the company is now testing the embedding of advanced digital capabilities into fully autonomous vehicles. When applying our model, the executive stressed the importance of *digital scenario planning* for the launch of its digital corporate strategy:

We reframed our strategic direction in [201X] and made digitalization as a big component of this new strategy. Our board has chosen a company-wide digital strategy to become more and more a tech company. We see ourselves no longer as a pure car manufacturer, we try to become a mobility provider. (Drive-Q-1)

To become a technology company, Drive refreshed its existing business model by using digital platforms and mobile technology to sell car-sharing services, which has created a supplementary multisided value proposition. Drive's strategic decision to enter the innovative and fast-growing mobility services segment identified new revenue streams, promoted the new electric ideology, and strengthened its strategic position against new digital competitors in the market. By *balancing digital portfolios*, the incumbent enhanced its traditional ownership model with a mobility services offering. As the senior executive explained:

Our current business model is still grounded in an ownership model, but with digitalization, we are shifting more and more to a service-oriented business model. Of course, this is highly dependent on the region, but in certain areas in the world, owning a car is no longer a status symbol as it has been some years ago. Instead it has become trendier to use a car, so we try to make use of the sharing economy and test out new digital services like payment per hour. (Drive-Q-2)

We found that Drive's refreshment of its product business model has replaced its traditional collaborative approach. The senior executive explained that Drive and its competitors in the automotive industry have historically focused on internal research and development (R&D) activities. However, the threat of disruptive competition encouraged Drive to use digital platforms to openly collaborate with an innovation ecosystem of direct rivals and start-ups to co-create and co-deliver new offerings. The participant stressed that this new and open collaborative approach will be instrumental for *improving the digital maturity* of the workforce:

We must speed up, become more agile in our daily life, and open our company boundaries to the outside world. (Drive-Q-3)

On the other hand, Powerhouse AG—a global industrial equipment manufacturer—is an exemplar of an organization-wide digital transformation that started by *replacing* the firm’s traditional multiproduct business model with a servitization logic by digitizing industrial products to create a range of new relational and multisided value propositions. This includes a new IoT platform that provides advanced analytics of real-time data for customers in several industries and digital consulting services that already account for 13% of its global revenues. However, despite Powerhouse’s corporate strategy to become an industrial leader in digitalization, the incumbent has witnessed unexpected competition when trying to defend its new business model. In the interviews, we asked the vice president of strategy to apply our model, which led the participant to discuss a range of initiatives that Powerhouse have taken to build sensing capabilities. He explained that the company had created specialized market intelligence departments to build new *digital scouting* and *digital scenario planning capabilities* to predict the emergence of future competitors from adjacent industries. But even with these advanced capabilities, he felt the company’s strategizing was still insufficient in today’s digital age:

Our strategy process is yearly based. How fast does a digital world change? Probably faster. We need to be more flexible and agile in future. For sure, our yearly budget-planning processes are potentially challenging for this digital space. (Powerhouse-Q-1)

Discussing how Powerhouse seizes on new opportunities, the participant focused on the importance of building *strategic agility* and *balancing digital portfolios*. The participant emphasized that strategic agility was required to rapidly reallocate resources to new internal projects, such sensors and autonomous robots, and external projects, such as acquiring proprietary technologies (e.g., smart data and analytics), that protect Powerhouse’s strategic position in the industrial equipment and services industry. As a result, he emphasized that *navigating innovation ecosystems* was the essential capability to ensure that Powerhouse continues to strategically renew its business model:

From a product perspective, the more digital you get, the more customer co-creation you do. You need to be fast in understanding and integrating customer requirements in these development processes. If you are not agile with your customer, you will not succeed. (Powerhouse-Q-2)

These themes were also apparent in Balance AG—an old private bank headquartered in Germany—that transformed its business model and collaborative approach to become a financial leader in digitalization. The managing director of digital banking explained the bank was slow to respond to the emergence of new digital competitors such as financial technology start-ups (e.g., FinTech’s) and Internet

players from adjacent industries that offer customer-centric banking services such as mobile payments or peer-to-peer lending. New disruptive competitors and the erosion of market share forced Balance to replace its traditional product logic with a business model that blends personal services and digital products to create and deliver a customized relational value proposition.

As a starting point, the participant explained that Balance had to build new sensing capabilities in *digital scenario planning* to improve the bank's understanding of customer needs. This encouraged the bank to "follow" customers down new digital channels. When asked to apply our model to describe the bank's digital transformation, the managing director initially stated:

As a starting point, you not only have to look at digitalization, but you also have to look on the whole business model you have. What must be digitized and what doesn't have to be digitized? Once you do a full analysis of the business model, you come to the point how does my future business model have to look to have a sustainable future? (Balance-Q-1)

When asked how the firm seized on this opportunity, the participant emphasized that *balancing digital portfolios* was necessary to ensure that digitalization did not encroach on the personal values and cultural heritage of the organization. The executive explained that Balance was known as a private and personalized bank, meaning that new digital products had to be blended with the firm's existing capabilities in personal banking. In describing the incumbent's digital transformation, the participant stressed the following:

You need to create a certain urgency without creating panic. Banks for the past 500 years have thought about the same stuff in an analogue way and were not digitized. Managers need to get all the people involved in digitalization. This is about changing a culture. This is the biggest challenge you have to do on a management level; you have to do a very delicate change process. (Balance-Q-2)

The participant explained that dramatic changes in consumer demand (e.g., "mobile-first" expectations) triggered this urgency for change and provided the executive team with enough support to replace the firm's existing business model. The sale of standardized products was replaced with a blended logic that created a relational value proposition that used digital products to deliver more customized financial services. The participant highlighted that to replace the business model, the firm had to build new capabilities in *navigating innovation ecosystems* to actively collaborate with external partners, which changed cost structures and drove new business model innovation:

We cooperate with FinTechs to insert the culture of digital innovation in our company and bringing people up to speed. Everybody has its own world in this ecosystem. Banks have to deal with

structures and regulatory, and FinTechs are faster and more technology focused. Getting these two worlds together and finding the reality somewhere in between is how you embrace the power of such an ecosystem. (Balance-Q-3)

Strategic renewal of collaborative approach

We found that the strategic renewal of an organization's collaborative approach extends the digital transformation of business models, incorporating a wider range of organizational activities. All the participants noted that digitalization has forced incumbents to change the way in which people collaborate across departments and divisions and to do so with a wider ecosystem of external partners. Table 3 shows how most incumbents have used digital technologies to refresh or replace existing internal and external collaboration activities.

Voice AG—a big and old telecommunications provider—is one organization that has digitally transformed its collaborative approach because they have *refreshed* existing internal R&D activities with new external R&D activities. During the interviews, the senior executive explained that in 2007, the subsidiary looked over the competitive threat (and opportunity) of IT infrastructure providers moving toward cloud-based computing. By 2012, advances in cloud computing had led to new digital competitors (e.g., Amazon and Microsoft), creating unprecedented customer demands for digital infrastructures not governed by this established player. The participant explained this new customer demand for new digital technologies had gradually “cannibalized” some of Voice's core IT infrastructure products, which was the major trigger to refresh its collaborative approach toward R&D. In the interviews, the participant identified that Voice has built strong sensing capabilities in *digital scouting*. When asking the participant to apply our model, he highlighted:

This [sensing] is happening in our scouting network. We currently have a trend team meeting that are looking for the latest trends in digitizing the food chain. What is happening for instance in blockchain to track ingredients, and circumstances in the food chain. There is an existing network throughout [Voice plc] and in [our subsidiary] which is very important. We have guys scouting around Silicon Valley, in Israel, and in Berlin looking out for the next big trends. So it is a network of people engaged in interesting and important developments regarding digitization. That is the scouting network we have deployed. (Voice-Q-1)

When asked how Voice tried to seize on new technological opportunities and respond to disruptive competition, the participant discussed the growing importance of external collaboration with players in “adjacent industries.” For example, the participant emphasized that Voice had built new capabilities in

rapid prototyping, which has been one of the organization's primary means for *balancing digital portfolios* and improving *strategic agility*. He explained:

We have a CEO workshop between [Voice], and [a large insurance group] to work out what we can do jointly in the digital area. And within a digital innovation lab environment, we have gone from a series of ideation workshops to a capability implementation, to now go to market, and launch of new products, such as a B2C security product that couples the capabilities from [Voice] and capabilities from [a large insurance group]. So that is a concrete example of how to speed up board discussions on what could we do to actually accelerate the whole process of a joint go to market. So, that was a process of ideation to product launch in 6 months. (Voice-Q-2)

Finally, the participant identified that *navigating innovation ecosystems* was an essential capability for supporting Voice's digital transformation. The participant explained that Voice had made the strategic decision to pursue R&D through open and multiplex forms of external collaboration. The participant explained this new R&D approach had helped the firm replace its business model with a digitalization services logic. This created a suite of customer-centric digital products and refreshed the company-wide approach to business collaboration:

One of our top strategies is to win with partners. To deliver new digital experience to a customer nowadays, means to fully involve competitors from adjacent industries and universities for co-creation. This is where innovation truly happens. Open innovation, working with many partners and working with universities to transfer new business model thinking is one of the most important factors to become a digital organization. (Voice-Q-3)

In contrast, Energy AG—a traditional German vertically integrated energy provider—replaced its company-wide approach to business collaboration. In 1998, the liberalization of the German energy market created a strategic challenge for Energy when the firm encountered stagnating revenues in its main business of commodity goods because of an influx of new competition. In addition, the rise of Internet comparison portals such as “Check24.de” or “Verivox.de” increased the price sensitivity of consumers and put further pressure on Energy's existing business model. When applying our process model, the director of sales explained how Energy's *digital scouting* network recognized the need to replace the traditional, commodity product business model with an emerging digitalization “prosumer” logic:

We observed our market for new revenue streams. We recognized that the whole energy industry offers huge potential to collect data and identify big data opportunities. Consumers turn into prosumers and provide valuable insights for predictive maintenance of home appliances and technical equipment. It is notable that none of the big Internet companies such as Google or Amazon have dared to enter the energy market to collect data so far. (Energy-Q-1)

The *digital scouting* for technological trends and competitor intelligence gathering triggered the strategic decision to engage in *rapid prototyping*. Instead of developing this capability within the old

legacy structures of the firm, the incumbent decided to establish a joint venture with other German digital players outside the company boundaries. Because prior collaboration was limited to a few knowledge-sharing initiatives, this joint venture replaced Energy's previous collaborative approach, as follows:

This change was not incremental, it was radical. The joint venture was provided with different working conditions, very loose structures and a start-up atmosphere. People got empowered in working with agile methods like SCRUM or Kanban and directly testing ideas with MVPs. (Energy-Q-2)

The joint venture was an important step for *improving the digital maturity* of the workforce. Energy's employees were empowered with the opportunity to work in a "digital innovation hub" environment and experience new forms of internal and external collaboration. Finally, *redesigning internal structures* provided Energy with a starting point to refresh its formal corporate culture with a new digital innovation corporate culture.

Strategic renewal of organizational culture

Our cross-case findings show that the strategic renewal of organizational culture is more apparent at an advanced stage of digital transformation. Transforming the business model and/or collaborative approach serves as preconditions to trigger deeper changes in corporate culture. Table 3 highlights that all incumbents have attempted to *refresh* their corporate culture with a wide range of digital initiatives. Interestingly, there was agreement among all executives that digitalization should not replace historic values but should rather continue to *refresh* the roots of corporate culture.

Motion AG—a global automotive supplier—is one organization that has *replaced* its business model and collaborative approach and is now at an advanced stage of digital transformation, having *refreshed* its corporate culture. In the interviews, the digital transformation manager emphasized that Motion had experimented with the creation and adoption of internal innovation methods to foster idea sharing and encourage internal collaborations. This refreshment of organizational culture was triggered in 2010 by the awareness of a competition race among Motion's competitors:

Our culture was being a fast follower. We screened the market and realized that in a digital world, there is just one market leader, and the distance to the followers is enormous. With our digital change initiative ["Dynamic Digital"], we transformed our organization from being a fast follower to being most progressive with technology and attractive for people. (Motion-Q-1)

When applying our model, the executive focused on *digital mindset crafting* for sensing new opportunities for “remaining relevant” for both customers and employees in the digital age. The participant explained that the “Dynamic Digital” campaign was a change management initiative that communicated four company values and drove the corporate strategy and long-term vision. Interestingly, the four company values were promoted to encourage *strategic agility* in the workplace. The “Dynamic Digital” campaign incorporated the introduction of mobile work, flexi-time work, and sabbaticals to improve strategic agility. The executive explained that the heart of this change management initiative was facilitated by the construction of a digital enterprise social network platform:

We recognized that we had to introduce an enterprise social network, that served as a vehicle for cultural development. So everybody was able to participate in organizational change projects across functions and hierarchies. (Motion-Q-3)

Returning to our model, the executive explained this social network platform was instrumental for *redesigning internal structures* and *improving the digital maturity* of the workforce. Moreover, the enterprise’s social network allowed the workforce to participate in ideation processes and collaborate in virtual teams across the organization. This helped Motion leverage digital knowledge inside the firm and connect the global workforce in unexpected ways across functions, hierarchies and locations. This digital platform and social media technology continue to play a significant role in the ongoing refreshment of Motion’s organizational culture.

However, Media Inc.—a global mass media company with a strong presence in Germany—was slow to replace its magazine print media business model with a mass media business model. Despite owning some of the world’s most elite magazine brands, this incumbent had historically prioritized print advertising over online advertising. With the rise of disruptive competition from a new generation of Internet media companies and social media platforms, the failure to adapt to the digital age had triggered an urgency for the incumbent’s rapid digital transformation. An early step in Media’s digital transformation journey was to appoint chief digital officers in international regions to expand the company’s digital product portfolio. This included digital media, data analytics, and a digital platform that scaled the generation of online advertising revenues across all of the company’s elite brands. In the interview, the chief digital officer of Europe emphasized the significance of *digital mindset crafting* and *strategic agility* to support the incumbent’s rapid digital transformation:

We accelerated our digital transformation considerably by starting to build a fully autonomous digital company within the company. This strategic move implied a change of team structures, internal collaboration, and the digital innovation unit became a part of the organization with its own logic. (Media-Q-1)

The digital innovation division provided Media with the opportunity to experiment with *rapid prototyping* to test out early-stage digital media offerings and seize new revenue streams. In this role, the chief digital officer established cross-functional teams to collaborate on “building” a company-wide digital strategy. This involved creating a “radical” company-wide approach to collaboration that supported the co-creation of new products with ecosystem players that included consumers and external business partners. The executive explained that *redesigning internal structures* was essential to accelerate this digital transformation:

Our primary intention to create a digital lab was to shape future business models, especially in the field of digital advertising. But then we realized that such an agile and open space environment is a unique channel to educate employees in new ways of collaboration and empower them to develop a real digital mindset. (Media-Q-2)

Here, the establishment of a decentralized digital innovation division had contributed to *improving the digital maturity* of the incumbent’s workforce. Therefore, the creation of a “real digital mindset” is strategic activity that ensures the ongoing refreshment of a traditional corporate culture that was slow to adapt to the digital age.

Discussion

Conceptualizing digital transformation

In the present qualitative study, we examined how incumbent firms in traditional industries build dynamic capabilities for digital transformation, and our findings have important implications for strategy research in fast-changing environments. During our research project, we aimed to make sense of digital transformation by drawing on senior executives’ lived experiences with digitalization projects (Chia and MacKay, 2007; Gioia et al., 2013). Throughout our fieldwork, we found that leaders in various industry circles inconsistently used the term “digital transformation” to describe various strategizing and organizing activities. For example, we observed that leaders would draw on strategic activities such as experimenting with rapid prototyping, moving operations to cloud computing, or simply establishing a digital marketing team as concrete examples of digital transformation. Indeed, by encountering such divergent opinions on what a digital transformation

really means, our industry-wide data show there is a general misalignment in strategic thinking, planning, and action on this topic. This is problematic, especially for incumbent firms because digital transformation is now a strategic imperative on most senior leadership agendas (Fitzgerald et al., 2013; Hess et al., 2017; Sebastian et al., 2017; Svahn et al., 2017).

A central contribution of the current study is the examination of the ongoing digital transformation of incumbent firms in a wide range of traditional industries. To explain this digital context, we have drawn on the IS literature to describe why the convergence and generativity of pervasive digital technologies are changing the “rules of the game” and creating unexpected strategic choices at product and platform levels (Nambisan et al., 2017; Tilson et al., 2010; Yoo et al., 2010). Consequently, the sheer reprogrammability and data homogenization of digital technologies have enabled the convergence and generativity of new digital products, services, business models, strategies, and organizational forms (Yoo et al., 2012). Because digitalization accelerates organizational change and amplifies environmental complexity, volatility, and uncertainty (Autio et al., 2018; Bharadwaj et al., 2013; Dattée et al., 2018), the digital transformation of incumbent firms is now an essential context for the study of strategic change.

We reported that digital transformation often starts with the strategic renewal of the incumbent’s business model and changes in business models, tending to lead to wider changes in the firm’s collaborative approach, which, if executed correctly, will eventually lead to deeper changes in organizational culture. Therefore, our findings align with perspectives that recognize strategic change as an ongoing process (Agarwal and Helfat, 2009; Tsoukas and Chia, 2002).

Indeed, since Weiser’s (1991) seminal article, IS scholars have been predicting early on that digitalization would accelerate everyday experiential computing, where new digitized products would shape changes in our social, institutional, and cognitive contexts (Lyytinen and Yoo, 2002; Tilson et al., 2010; Yoo, 2010). Our research provides further context on situations where digitalization is driving changes in corporate strategies that aim to digitally transform an incumbent’s business models, organizational structures, and processes. Bringing these theoretical perspectives together, we argue that digital transformation is an ongoing process of using new digital technologies in everyday organizational life, which recognizes agility as a core mechanism for strategic renewal. As a result, we contribute to the literature by providing an empirically grounded definition that conceptualizes the *scope* of digital transformation, as follows:

Digital transformation is an ongoing process of strategic renewal that uses advances in digital technologies to build capabilities that refresh or replace an organization's business model, collaborative approach, and culture.

Yoo et al. (2010: 731) emphasize that we “need new theoretical frameworks for competitive strategy and for the development of digitized products that are based on dynamic and fluid views on products.” As outlined in Figure 2, our process model conceptualizes digital transformation as a process of building dynamic capabilities for the ongoing strategic renewal of an organization's business model, collaborative approach, and eventually the culture. Our findings show that the *scope* of digital transformation varies on these three dimensions, where some incumbents such as Drive are at an earlier stage in refreshing business models, while other firms such as Balance, Motion, or Media are at an advanced stage, having replaced collaborative approaches and refreshed traditional cultures. Our conceptualization of digital transformation serves to provide scholars and practitioners with a holistic framework that can be used to examine the strategic renewal of business models but that also considers wider organizational behaviors such as how digital technologies replace the way people work and how corporate cultures can be refreshed in the long term.

Building dynamic capabilities for digital transformation—a contingency approach

To explore digital transformation, we took a novel methodological approach to develop a breadth and depth of contextuality (Gioia et al., 2013). We collected and analyzed a wide range of case data that span several industries. We interviewed the authors of published strategy consultancy reports on digitalization and combined this with case study data that drew on senior executives' experiences with leading incumbents' digital transformation. Therefore, we focused on the senior executive's perspective (Chia and MacKay, 2007; Jarzabkowski, 2004; Regnér, 2008; Whittington, 2006), emphasizing the individual practitioner's point of view concerning the practice of strategic activities for digital transformation.

By asking senior executives to use a dynamic capabilities lens to share their lived experiences, we identify nine digitally grounded microfoundations (e.g., subcapabilities) that underpin the building of dynamic capabilities for digital transformation. In line with Vue (2017), we found that incumbents must build a system of dynamic capabilities for digital transformation. Indeed, although activities in isolation such as “creating minimal viable products” and “analyzing scouted signals” are examples of nondigital

change, in combination with digital activities such as “formulating digital strategies,” “promoting digital mindsets,” and “hiring a chief digital officer” highlight an essential context for the study of strategic change. In contrast to nondigital-based strategic change, we argue that the ubiquity of new digital technologies is changing the very nature and purpose of dynamic capabilities. In particular, the convergence and generativity of digital technologies means that building dynamic capabilities is now a strategic imperative for incumbents to ensure survival in the digital era.

Our process model reveals the generic contingency factors that trigger, enable, and hinder the building of dynamic capabilities for digital transformation. By revealing these contingency factors, our model shows that building dynamic capabilities is idiosyncratic to each digital transformation, which involves ongoing refreshments and replacements of business models, collaborative approaches, and cultures. Our model reveals that as soon as organizations construct a pathway to digital transformation, new external triggers arise, recalibrating the need for sensing and seizing new opportunities.

Our findings on building *digital sensing capabilities* contributes to the dynamic capabilities literature. Interestingly, the literature has yet to fully report on the fact that organizations need to build sensing capabilities that are increasingly digitized (Nambisan et al., 2017; Sebastian et al., 2017). In a digital era of information abundance (Bharadwaj et al., 2013), our data emphasize that building new capabilities in *digital scouting* and *digital scenario planning* are essential for quickly making sense of unexpected trends in fast-changing environments. Our findings resonate with recent research that reports on organizations that have built scouting (e.g., Monteiro and Birkinshaw, 2017) and strategic planning capabilities (Dong et al., 2016; Matt et al., 2015) to better equip themselves for a digital age. However, in addition to these strategic functions, our data emphasize that *digital sensing capabilities* require *digital mindset crafting*, which can be enabled through cross-functional teams and hindered by rigid forms of strategic planning. *Digital mindset crafting* brings the classical principals of strategic thinking to the fore (Mintzberg, 1994), supporting recent research that shows new forms of strategic thinking are required to avoid disruptive threats such as the “digital war” for new talent (Kane et al., 2017).

Our findings contribute to the research on *strategic agility* because we argue this is a critical dynamic capability for seizing new digital trends. Our data show that fast decision making is central to seizing technological opportunities and aligns with existing research that strategic agility is central for operating in

conditions of deep uncertainty (Doz and Kosonen, 2010; Rigby et al., 2016; Teece et al., 2016). Our findings emphasize that building *digital seizing capabilities* are contingent on pacing strategic actions, which aligns with dynamic capabilities research in hypercompetitive contexts (Eisenhardt and Martin, 2000; Peteraf et al., 2013; Sambamurthy et al., 2003). Eisenhardt and Martin (2000: 1115-1116) argue that the evolution of dynamic capabilities involves the pacing of experience and time-pacing skills for creating profitable product development cycles. Interestingly, our data indicate that within a digital context, organizations must specialize in pacing strategic actions, which, again, is a mindset that accepts the reality that failed sprints, constant redirection, and temporary advantages are common ways of life in the digital age. In other words, our data align with existing research that strategic agility is the driving force for ongoing business model innovation (Teece et al., 2016; Volberda et al., 2018; Sebastian et al., 2017).

Finally, our findings emphasize that digital transformation involves the ongoing strategic renewal of an organization's collaborative approach and eventually the culture. Unlike recent research that concentrates on technology adoption in digital transformations (Karimi and Walter, 2016; Li, 2017), our findings show that *improving the digital maturity* of the workforce is a fundamental dynamic capability for ongoing digital transformations. Our findings resonate with the research on management innovations, such as the building of new digital governance capabilities to digitally transform internal collaborative approaches (Birkinshaw, 2018; Singh and Hess, 2017). Moreover, our findings show the importance of *navigating innovation ecosystems*, which is reported to be an emerging form of radical business model innovation (Autio et al., 2018; Dattée et al., 2018; Nambisan et al., 2017; Zahra and Nambisan, 2012).

Conclusion

In the current paper, we examined how incumbent firms in traditional industries build dynamic capabilities for digital transformation and conceptualized digital transformation as a process of building dynamic capabilities for ongoing strategic renewal. Therefore, we contribute to Peteraf et al.'s (2013) call for contingency-based research by revealing digital transformation as a context for strategic change. However, as with all exploratory research, the current study is not without its limitations. One limitation concerns the transferability of our findings to wider research contexts because our model is grounded in observations directly related to digital transformation. It is unclear if our model is applicable to a broader population of firms in fast-changing or moderately dynamic environments. Our focus was on a practitioner's perspective,

meaning we used qualitative methods to extract meaning from processes rather than used quantitative methods to measure the effects of digital transformation on variables such as organizational survival, growth, and performance. To move this agenda forward, we suggest survey research that operationalizes our framework to provide new insights into the long-term organizational effects of digital transformation.

To advance this work, future research could explore how ordinary capabilities interact with dynamic capabilities for digital transformation over time (Teece, 2014). Further studies are also needed to assess the relevance of new ventures in their building of dynamic capabilities for digitalization (Autio et al., 2018; Huang and Henfridsson, 2017), which would contribute to the debate of their role and intended purpose (Barreto, 2010). Further research could also compare if there is a difference in building dynamic capabilities guided by consultants versus a process without consultancy. Finally, in a world of disruptive competition, pervasive digital technologies, and changing consumer behaviors, the sources of a competitive advantage are increasingly unknown (McGrath, 2013). Hence, more research needs to explore the temporal role that digital transformation plays in the maintenance of transient competitive advantage.

Figures and Tables

Figure 1: Data structure

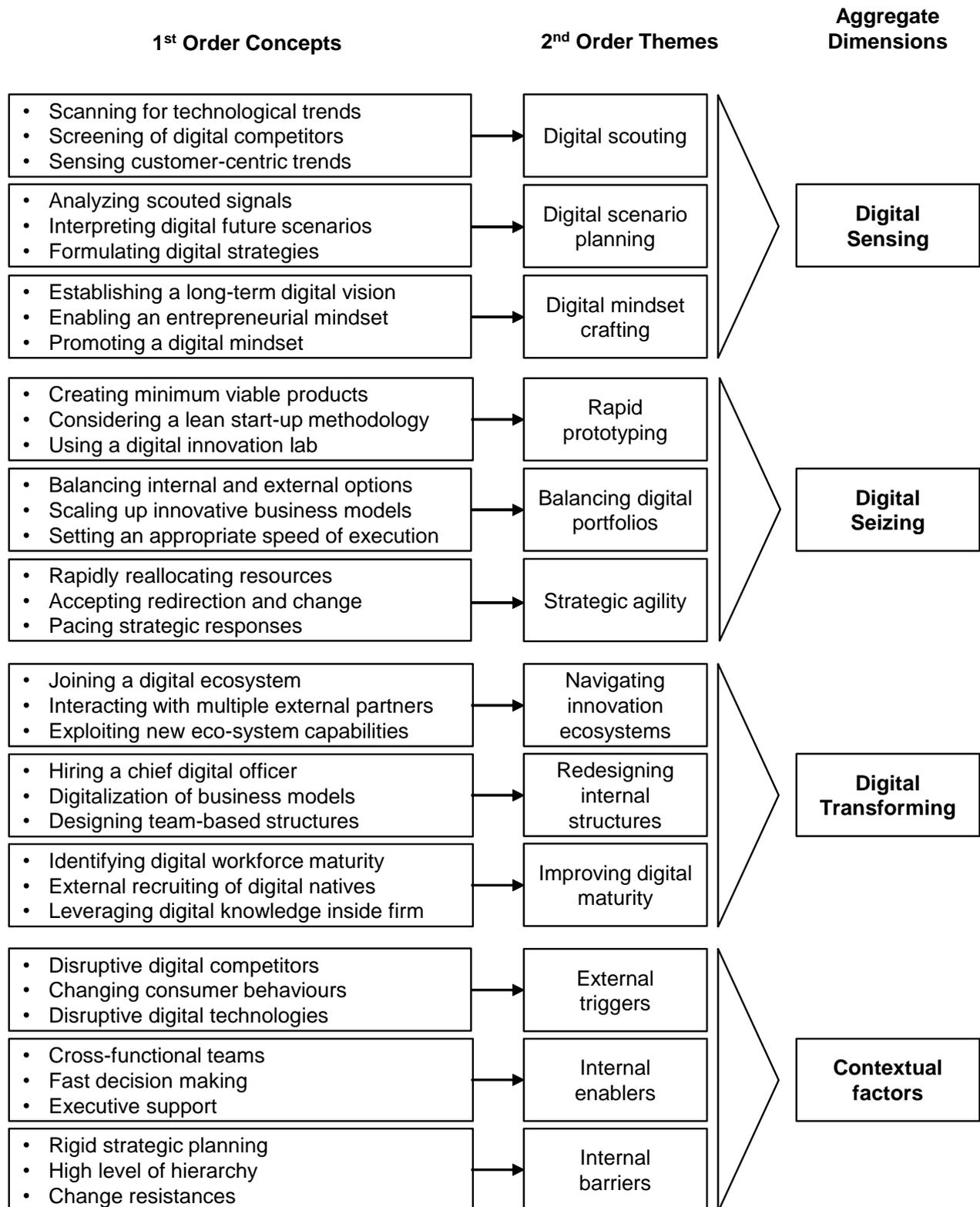


Figure 2: Building dynamic capabilities for digital transformation: A process model

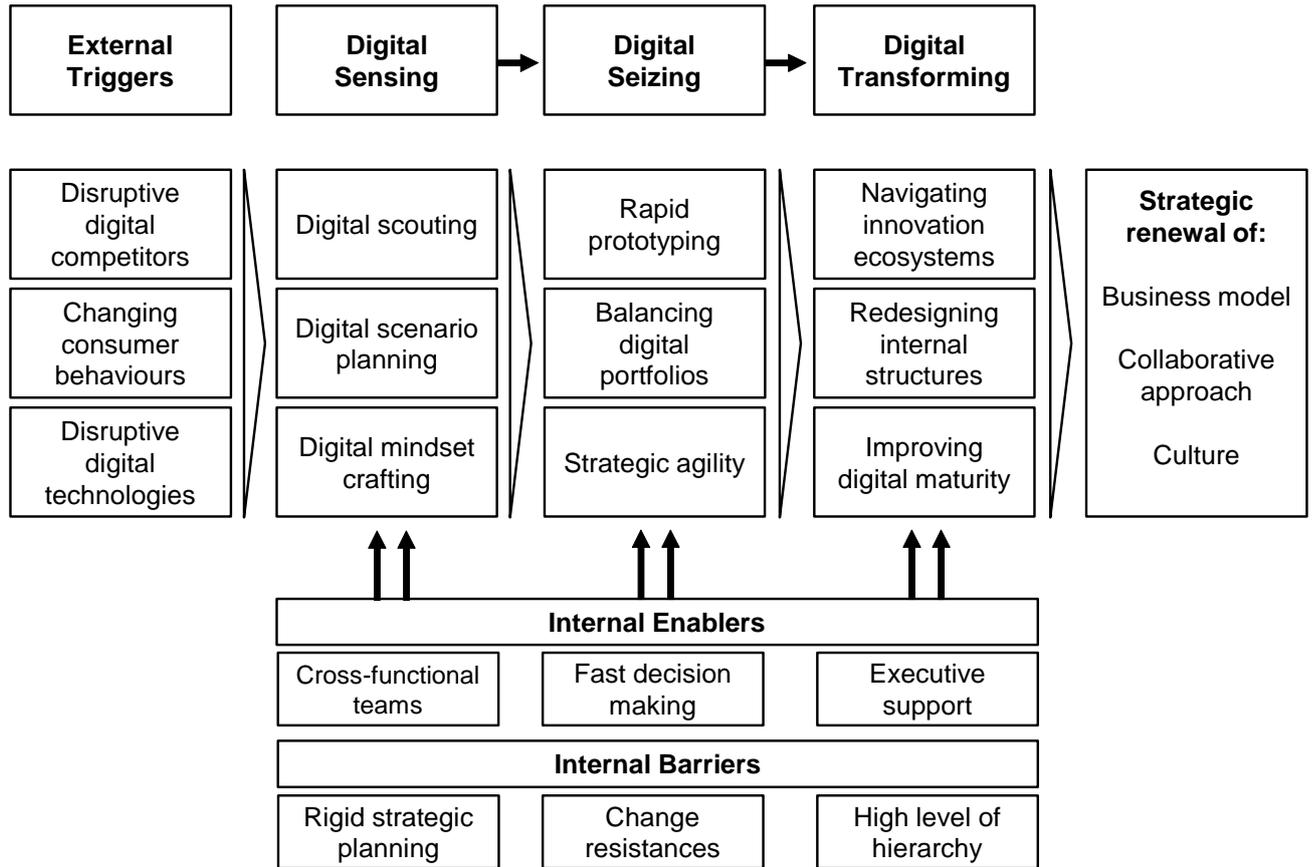


Table 1: A digital technology perspective

Concepts	Definition	Examples (alphabetical)
Digital technologies	“Digital technologies (viewed as combinations of information, computing, communication, and connectivity technologies) are fundamentally transforming business strategies, business processes, firm capabilities, products and services, and key interfirm relationships in extended business networks” (Bharadwaj et al., 2013: 471).	<ul style="list-style-type: none"> • Analytics • Artificial intelligence • Blockchain • Cloud • IoT • Mobile • Social media
Digitization	“The encoding of analog information into digital format. Digitization makes physical products [e.g. artifacts] programmable, addressable, sensible, communicable, memorable, traceable and associable” (Yoo et al., 2010: 725).	<ul style="list-style-type: none"> • Books • Clothing • Home appliances • Music
Digital innovation	“Digital innovation as the carrying out of new combinations of digital and physical components [in a layered modular architecture] to produce novel products” (Yoo et al., 2010: 725).	<ul style="list-style-type: none"> • Amazon Kindle • Apple iPhone • Nest Thermostat • Nike+ <i>Sensor</i>
Digital artifact	“A digital component, application, or media content that is part of a new product (or service) and offers a specific functionality or value to the end-user” (Nambisan, 2017: 1031).	<ul style="list-style-type: none"> • Computer files • Internet • SaaS • Wiki
Digital platform	“A digital product platform typically encompasses a particular range of layers (e.g., content and service layers) that can function as a new product, but simultaneously enable others to innovate upon (Gawer and Cusumano, 2008) using firm-controlled platform resources (e.g., SDKs and APIs)” (Yoo et al, 2010: 729).	<ul style="list-style-type: none"> • Autodesk Forge • Ethereum • Ford SYNC 3 • GE Predix • Google Android
Digital infrastructure	“Digital technology tools and systems (e.g., cloud computing, data analytics, online communities, social media, 3D printing, digital makerspaces, etc.) that offer communication, collaboration, and/or computing capabilities to support innovation and entrepreneurship” (Nambisan, 2017: 1032).	<ul style="list-style-type: none"> • Amazon Web Services • Intel Inside® • Microsoft Azure • SAP® Analytics
Digitalization	<p>“The digitalization of these four dimensions of human experience [time-space-artifact-actor] forms the basis of experiential computing” (Yoo, 2010: 220).</p> <p>“A sociotechnical process of applying digitizing techniques to broader social and institutional contexts that render digital technologies infrastructural” (Tilson et al., 2010: 749).</p> <p>“Digitalization creates potent digital affordances that likely have a transformative effect upon the organization of economic activity by supporting radical business model innovation” (Autio et al: 2018: 76).</p>	<ul style="list-style-type: none"> • Alibaba Group • Alphabet Inc. • Amazon.com • Apple Inc. • Facebook Inc. • Microsoft Corp. • NetEase Inc. • Paycom Software Inc. • Tencent Holding Ltd. • Tesla Inc. • Uber
Digital transformation	“Digital transformation is concerned with the changes digital technologies can bring about in a company’s business model, which result in changed products or organizational structures or in the automation of processes” (Hess et al., 2016: 124).	<ul style="list-style-type: none"> • General Electric • ING Group • ProSiebenSat.1 Media SE (P7S1) • Volvo

Table 2: Purposeful sample and scope of data collection

	Motion AG	Powerhouse AG	Balance AG	Voice AG	Energy AG	Drive AG	Media Inc.
Case overview							
<i>Industry</i>	Automotive	Industrial	Banking	Telecoms	Energy	Automotive	Media Publisher
<i>Size (employees)</i>	+100.000	+100,000	1000-5000	+100,000	5000 - 10,000	+100,000	1000-5000
<i>Revenues (2017)</i>	€25-50 billion	€50-100 billion	€1-5 billion	€50-100 billion	€1-5 billion	€100-200 billion	€1-5 billion
<i>Founded</i>	Late 1800s	Late 1800s	Early 1900s	1950s	Late 1800s	Early 1900s	Early 1900s
<i>Firm type</i>	Parent	Parent	Subsidiary	Subsidiary	Parent	Parent	Subsidiary
<i>Market focus</i>	Global	Global	Europe	Global	Europe	Global	Global
Scope of case study data							
<i>Interviews</i>	2	2	2	2	1	1	1
<i>Position</i>	Director of digital Transformation	Vice president of strategy	Director of digital banking	Head of digital consulting	Director of sales	Director of digital strategy	Chief digital officer
<i>Leadership experience</i>	15 years	10 years	15 years	11 years	7 years	17 years	13 years
<i>Education</i>	Diploma	MSc	Diploma	MSc	MSc	MSc	Diploma
<i>News reports</i>	11	20	11	15	12	21	15
<i>Annual reports</i>	2000-2017	2007-2016	Private	2000-2017	2007-2016	2006-2017	Private
Scope of consultancy data							
	<i>Position</i>	<i>Leadership experience</i>	<i>Education</i>	<i>Major industry exposure</i>	<i>Other industry exposure</i>	<i>Published reports</i>	<i>Participant observation</i>
Build ltd.	1 senior partner	8 years	PhD	Automotive	Mobility	3	
Connect ltd.	1 senior manager	5 years	MSc	Retail	Automotive	1	
Digitize ltd.	1 mgt director	8 years	MSc	Finance	Automotive	1	10 weeks
Redesign ltd.	1 senior partner	5 years	MSc	Automotive	Telecoms	2	
Seize ltd.	1 principal	8 years	MSc	Media	Automotive	2	
Navigate ltd.	2 senior partners	12/10 years	MPA/MSc	Media	Automotive	8	
Totals/summary	18 in-depth interviews	144 years combined leadership experience	Diploma-PhD education	Experience across 8 industry contexts	105 company news reports	80 published reports	10 weeks of participant observation

Table 3: Three forms of digital transformation

Incumbent firm	Renewal of business model	Renewal of collaborative approach	Renewal of culture
Motion AG	<p>Prior business model: Automotive multiproduct supplier. Sale of standardized products created transactional value propositions.</p> <p>Replaced business model with new digitalization logic. The sale of tailored services using mobility services, IoT, cloud, and artificial intelligence is creating relational and multisided value propositions.</p>	<p>Prior collaboration: Limited internal collaboration because of silo mentality between departments.</p> <p>Replaced collaboration with an enterprise social network to remove work silos and facilitate company-wide knowledge sharing.</p>	<p>Prior culture: Known as a traditional automotive and transportation original equipment manufacturer (OEM) supplier.</p> <p>Refreshed culture to become a technology leader and pioneering software company most attractive for its people.</p>
Powerhouse AG	<p>Prior business model: Industrial equipment multiproduct manufacturer. Sale of standardized products created transactional value propositions.</p> <p>Replaced business model with new digitalization services logic. Sale of new digitized products is creating relational and multisided value propositions.</p>	<p>Prior collaboration: Limited initiatives in place to support knowledge-sharing for internal or external collaboration.</p> <p>Refreshed collaboration with cross-functional “working out loud” approach to co-create products across silos and with ecosystem partners.</p>	<p>Prior culture: Traditional corporate culture based on efficiency, profit maximization, and compliance.</p> <p>Refreshed culture with a new digital vision and innovation-driven ownership culture.</p>
Balance AG	<p>Prior business model: Financial provider of physical banking services. The sale of standardized products created transactional value propositions.</p> <p>Replaced business model with digital banking. The sale of personal services and digitized products is creating relational value propositions.</p>	<p>Prior collaboration: Strong focus on internal initiatives with almost no connection to an external ecosystem for knowledge sharing.</p> <p>Replaced collaboration with external collaboration in a wide ecosystem of young and disruptive Fintech players.</p>	<p>Prior culture: A traditional and formal banking culture with a strong focus on personal banking advice.</p> <p>Refreshed culture with digital banking while protecting the bank’s cultural heritage as the “family bankers.”</p>

Voice AG	<p>Prior business model: Telecommunications provider. The sale of standardized products created transactional value propositions.</p> <p>Replaced business model with a digitalization services logic. The sale of tailored services using Cloud, IoT, and big data are creating transactional and multisided value propositions.</p>	<p>Prior collaboration: Strong focus on internal R&D activities to protect market leadership.</p> <p>Refreshed collaboration with open innovation activities across the whole company.</p>	<p>Prior culture: A traditional mindset to be a dominant telecommunications provider.</p> <p>Refreshed culture by establishing a new subsidiary to create a digital innovation culture.</p>
Energy AG	<p>Prior business model: Vertically integrated energy provider. The sale of standardized commodity products created transactional value propositions.</p> <p>Replaced business model with a digitalization “prosumer” logic. The sale of tailored services using predictive maintenance, cloud, and IoT is creating multisided value propositions.</p>	<p>Prior collaboration: Limited initiatives in place to support knowledge sharing for internal or external collaboration.</p> <p>Replaced collaboration with the establishment of a digital joint venture to facilitate internal and external collaboration to work with “prosumers.”</p>	<p>Prior culture: Known as a traditional energy provider with a formal corporate culture.</p> <p>Refreshed culture by establishing a digital joint venture to start creating openness and a digital innovation culture.</p>
Drive AG	<p>Prior business model: Automotive multiproduct manufacturer. The sale of standardized products created transactional value propositions.</p> <p>Refreshed business model with digitalization services logic. The additional sale of rental services using digital platforms and cloud is creating multisided value propositions.</p>	<p>Prior collaboration: Strong focus on internal R&D activities to protect innovation power from competitors.</p> <p>Replaced collaboration with a radical company-wide approach to co-create new products with ecosystem players.</p>	<p>Prior culture: Traditional corporate culture based on responsibility, trust, and first-class performance.</p> <p>Refreshed culture by weaving new digital innovations into existing corporate culture.</p>
Media AG	<p>Prior business model: Print media multiproduct content publisher. The sale of standardized products created transactional value propositions.</p> <p>Replaced business model with digitalization services logic. The sale of new mass media, data analytics, and advertising on a digital platform is creating new multisided value propositions.</p>	<p>Prior collaboration: Limited initiatives in place to support knowledge sharing for internal or external collaboration.</p> <p>Replaced collaboration with a radical company-wide approach to co-create new products with ecosystem players.</p>	<p>Prior culture: Traditional and formal corporate culture with a strong focus on marketing and brand management.</p> <p>Refreshed culture by reinventing the organization as a mass media company in pursuit of new digital innovations.</p>

Table 4: Digital transformation as a context for strategic change

Incumbent firm	Major trigger of digital transformation	Scope of digital transformation	Main dynamic capabilities discussed		Key successes (so far)
Motion AG	New digital technologies	Organizational wide	<i>Sensing:</i> <i>Seizing:</i> <i>Transforming:</i>	Digital mindset crafting Strategic agility Improving digital maturity	Launched digital solutions monitoring platform Replaced product logic with a digital services model Launched digital culture training program
Powerhouse AG	New digital technologies	Organizational wide	<i>Sensing:</i> <i>Seizing:</i> <i>Transforming:</i>	Digital scouting Balancing digital portfolios Navigating innovation ecosystems	Replaced product logic with a digital services model Global launch of Industry 4.0 product portfolio Digital products account for 13% of global revenues
Balance AG	Changing consumer demands	Business model & collaborative approach	<i>Sensing:</i> <i>Seizing:</i> <i>Transforming:</i>	Digital scenario planning Balancing digital portfolios Navigating innovation ecosystems	Refreshed business model with “blended” logic German excellence award for “strategy and innovation” Award for being Germany’s most customer-centric bank
Voice AG	Changing consumer demands	Business model & collaborative approach	<i>Sensing:</i> <i>Seizing:</i> <i>Transforming:</i>	Digital scouting Rapid prototyping Navigating innovation ecosystems	Founded scouting networks in world’s technology hubs Founded digital lab to launch MVPs New R&D software alliances are replacing product logics
Energy AG	Disruptive competition	Business model & collaborative approach	<i>Sensing:</i> <i>Seizing:</i> <i>Transforming:</i>	Digital scouting Rapid prototyping Redesigning internal structures	Replaced product logic with a “prosumer” model Founded digital joint venture to attract entrepreneurial talent and to enhance internal and external collaboration
Drive AG	Disruptive competition	Business model & collaborative approach	<i>Sensing:</i> <i>Seizing:</i> <i>Transforming:</i>	Digital scenario planning Balancing digital portfolios Improving digital maturity	Launched digital corporate strategy Refreshed business model with “digitalization” logic by balancing traditional ownership with mobility services
Media AG	Changing consumer demands	Organizational wide	<i>Sensing:</i> <i>Seizing:</i> <i>Transforming:</i>	Digital mindset crafting Strategic agility Redesigning internal structures	Appointed senior digital leadership team Founded digital strategy division to start transformation Redesign of traditional business units

Appendix 1: Paths to second-order themes development

Key activities	Build ltd.		Connect ltd.		Digitize ltd.		Redesign ltd.		Seize ltd.	
	Repo rt	Interv iew	Repo rt	Interv iew	Repo rt	Interv iew	Repo rt	Interv iew	Repo rt	Interv iew
Scanning for technological trends	○	○			○	○	○	○	○	○
Screening of digital competitors	○	○	○	○	○	○				
Sensing customer-centric trends	○		○	○						○
Digital scouting	●	●	●	●	●	●	●	●	●	●
Analyzing scouted signals			○	○	○	○				
Interpreting digital future scenarios			○	○			○	○		
Formulating digital strategies		○	○	○	○	○	○	○	○	○
Digital scenario planning		●	●	●	●	●	●	●	●	●
Establishing a long-term digital vision	○	○		○			○	○	○	○
Enabling an entrepreneurial mindset	○		○	○		○			○	○
Promotion a digital mindset				○			○	○	○	○
Digital mindset crafting	●	●	●	●		●	●	●	●	●
Creating minimum viable products	○	○					○	○	○	○
Considering a lean start-up methodology	○	○				○	○	○		
Using a digital innovation lab	○	○		○			○	○		
Rapid prototyping	●	●		●		●	●	●	●	●
Balancing internal and external options			○	○	○	○				○
Scaling up innovative business models	○	○						○	○	○
Setting an appropriate speed of execution	○	○	○	○		○				
Balancing digital portfolios	●	●	●	●	●	●		●	●	●
Pacing strategic responses	○	○		○			○	○		

Rapidly reallocating resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>		
Accepting redirection and change	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>
Strategic agility	<input checked="" type="radio"/>								
Joining a digital ecosystem	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Interacting with multiple external partners	<input type="radio"/>								
Exploiting new ecosystem capabilities	<input type="radio"/>	<input type="radio"/>					<input type="radio"/>	<input type="radio"/>	
Navigating innovation ecosystems	<input checked="" type="radio"/>								
Hiring a chief digital officer	<input type="radio"/>		<input type="radio"/>						
Digitalization of business models	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>		<input type="radio"/>	
Designing team-based structures	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>		<input type="radio"/>		<input type="radio"/>	
Redesigning internal structures	<input checked="" type="radio"/>		<input checked="" type="radio"/>						
Identifying digital workforce maturity	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>
External recruiting of digital talent						<input type="radio"/>		<input type="radio"/>	<input type="radio"/>
Leveraging digital knowledge inside firm							<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Improving digital maturity	<input checked="" type="radio"/>	<input checked="" type="radio"/>			<input checked="" type="radio"/>				
Disruptive digital competitors	<input type="radio"/>								
Changing consumer behaviors	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>	<input type="radio"/>			<input type="radio"/>
Disruptive digital technologies	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>					
External triggers	<input checked="" type="radio"/>								
Cross-functional teams	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					<input type="radio"/>
Fast decision making	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>				
Executive support		<input type="radio"/>							
Internal enablers	<input checked="" type="radio"/>								
Rigid strategic planning	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>				
Change resistances	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>				
High level of hierarchy	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	
Internal barriers	<input checked="" type="radio"/>								

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