

**MASTER**

**Building dynamic capabilities for digital business model innovation**

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*Award date:*  
2022

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# Building dynamic capabilities for digital business model innovation

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In partial fulfilment of the requirements for the degree of:  
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Eindhoven, July 2022

## KEYWORDS

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*Dynamic capabilities, digital transformation, digitalization, business model innovation, microfoundations*

## ABSTRACT

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**Background:** With the developments of digital technologies organizations are increasingly engaging in digital business model innovation as part of their digital transformation. Due to the significant differences in nature and structure of digital innovation organizations need firms need to obtain a new set of capabilities that facilitate the ongoing strategic renewal of an organization's business model. This study builds on the premise that organizations need to build strong dynamic capabilities to rapidly create, implement and reconfigure business models to remain relevant in the emergent digital economy.

**Purpose:** This qualitative study is aimed to explore how organizations build dynamic capabilities for digital business model innovation. This thesis has investigated how the nature of digital innovation impacts the dynamic capabilities for business model innovation and organizations can build these. Based on a multiple case study this study maps (1) which critical dynamic capabilities are essential for digital business model innovation (2) what interventions can help incumbent firms to build dynamic capabilities for digital business model innovation.

**Methodology:** For this thesis a multiple case study was performed at 5 case companies in the process of digital transformation. Semi-structured interviews with 15 participants are held and additional project documents were analysed.

**Findings:** This study has emphasized differences in business model innovation in the digital age compared to the traditional view. This thesis reveals that firms need strong dynamic capabilities to successfully innovate its business model in a digital environment. Additionally, this study has indicated 12 critical capabilities with accompanied interventions that help organizations to build these dynamic capabilities. This specification results in a set of practice-oriented design principles that allows managers to adapt, develop or build critical dynamic capabilities that help to develop digital business models successfully.

## EXECUTIVE SUMMARY

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Digital technology has disrupted industries and organizations over the past years and will continue to do so. Organizations are using digital technologies to innovate their business model to create and appropriate more value for the firm. This digital transformation offers organizations with several benefits such as Improved financial performances, firm growth, reputation and a competitive advantage. However, despite its large benefits, firms in the process of digital transformation often encounter significant challenges to digitally innovate their business model. This is because digital innovation differs from traditional forms of strategic change, as digital technologies accelerate the speed of change, resulting in significantly more environmental complexity, volatility, and uncertainty. Furthermore, digital innovation has radically changed the nature and structure of new products, services, business models, and the entire innovation process itself. Thus, to engage in DT, firms need a new set of capabilities that help to facilitate the ongoing digital innovation of an organizations business model.

This study has used the theoretical lens dynamic capabilities for studying digital business model innovation. Dynamic capabilities are defined as a firm's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing business environments (Teece, 2007; Teece et al., 1997). So, they differ from operational or 'ordinary' capabilities who are focussed on maintaining a current process or given direction. Whereas dynamic capabilities are used to redirect resources, processes and exiting capabilities to higher payoff endeavours.

Therefore, this study highlights that firms need to build strong dynamic capabilities to rapidly create, implement and reconfigure business models to remain relevant in the emergent digital economy. For that reason, this study is aimed to understand what dynamic capabilities are needed to support digital business model innovation and how organizations can build these capabilities. To fulfil this goal the research question shown in table 1 is answered:

Main RQ	How to facilitate firms in building dynamic capabilities for digital business model innovation?
Sub 1	How can business model innovation be conceptualized in a digital context?
Sub 2	What dynamic capabilities are needed for business model innovation in a digital context?
Sub 3	What interventions can be identified that enable firms to build dynamic capabilities for business model innovation in a digital context?

For, the first two sub-questions, a theoretical analysis is conducted. The second research question is subsequently answered by combining and comparing the findings form theoretical and empirical data. The third research question is solely answered by empirical data.

First, the unique characteristic of digital technology has several implications for the innovation outcome as well as for the innovation process. This especially explains *why* firms need to build particular capabilities and the underlying cause of this change process. Nambisan (2017) argues that the digitalization challenges three key assumptions in traditional innovation

processes. Digital innovation processes are characterized by (1) less bounded innovation outcomes, (2) more interaction between innovation processes and outcomes, and (3) distributed innovation agency (Nambisan et al., 2017). Therefore, this study emphasize that firms need to build relevant capabilities to overcome these challenges. In line with previous research this study highlights that firms need to build strong dynamic capabilities to rapidly create, implement, and reconfigure business models to remain relevant in the emergent digital economy.

Second, this study has specified *what* dynamic capabilities are needed for digital business model innovation. This study has first specified six higher-order dynamic capabilities that ought to be relevant for digital business model innovation. These capabilities are subsequently supported by twelve critical capabilities that specify the dimensions of the higher-order dynamic capabilities. Therefore, this study proposes the framework displayed in figure 1.

Higher-order	Sensing		Seizing		Reconfiguring	
	<u>BM sensing</u> The ability to continuously identifying, experimenting with and exploiting of new business models	<u>Technology sensing</u> The ability to acquire new, emerging technological know-how and relate this knowledge to specific business model components	<u>Develop business models</u> The ability to operationalize market, technology and business model knowledge through continuous and fast-passed experimentation	<u>Coordinate BMI</u> The ability to configure, combine and mix each of these business model components to develop complementary value propositions	<u>Integration capability</u> The ability to align activities, resources, capabilities and investments with partners in addition to facilitate internal coordination	<u>Orchestration capability</u> The ability to source, evaluate and select new processes, resources, competences and assets to support new business models
Critical capabilities	Scan and monitor the external environment	Collaborate with external partners for ideation	Rapidly develop, validate and experiment with new business models	Strategic agility and innovation alignment	Enhance internal knowledge exchange and integration	Redesign and reconfigure organizational structure
	Integrate customers into the ideation phase	Recognize and interpreted value of external environment	Customer integration into the development process	Balance digital portfolios & strategic investments	Scale the business model through partnerships and digital ecosystems	Provision and reconfigure key competences

Figure 1 Dynamic capabilities for digital business model innovation

Lastly, this study provides more empirical research by explaining the micro processes that contribute to the development of dynamic capabilities. A list of practice-oriented interventions has been identified that help to build the dynamic capabilities for digital business model innovation. These interventions particularly show *how* a firm can engage in digital business model innovation. Furthermore, these interventions highlight some specific processes and activities are becoming more digitally driven or have emerged with to rise of digital technologies.

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# 1 INTRODUCTION

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Many corporates today evolve due to digital technologies such as big data, artificial intelligence, cloud computing, social networks, and the internet of things. The development of digital technologies has emphasized the need for reshaping business models (Bharadwaj et al., 2013; Yang et al., 2012), particularly in highly dynamic and competitive business environments (Wirtz et al., 2016). Digital business models help firms to increase several dimensions of organizational performance, such as financial performance (Karimi & Walter, 2015), firm growth (Tumbas et al., 2015), reputation (Yang et al., 2012), as well as competitive advantage (Neumeier et al., 2017). Therefore, digital transformation has emerged as a central phenomenon in both research (Bharadwaj et al., 2013), and practice (Bonnet & Westerman, 2021; Fitzgerald et al., 2013). Digital transformation is defined as 'a change in how a firm employs digital technologies, to develop a new digital business models that helps to create and appropriate more value for the firm' (Verhoef et al., 2021, p. 889).

Despite its large benefits, firms in the process of digital transformation often encounter significant challenges to digitally innovate their business model (Berman, 2012; Fitzgerald et al., 2013; Legner et al., 2017; Nylén & Holmström, 2015; Parviainen et al., 2017; Velu & Stiles, 2013). To embrace digital innovation, firms must develop new capabilities to identify and develop digital business models within existing institutional context (Yoo et al., 2012). However, this is challenging because this uncovers complex tensions with existing systems as it requires significant shifts in firms identity, organizational culture and structure (Svahn et al., 2017). As Chesbrough addresses, although firms might possess extensive experience in exploring new ideas and technologies "they often have little if any ability to innovate the business models" (Chesbrough, 2010, p. 354). Moreover, literature highlights that digital innovation differs from traditional forms of strategic change, as digital technologies accelerate the speed of change, resulting in significantly more environmental complexity, volatility, and uncertainty (Loonam et al., 2018; Matt et al., 2015). Furthermore, digital innovation has radically changed the nature and structure of new products, services, business models, and the entire innovation process (Nambisan et al., 2017). Thus, to engage in digital transformation, firms need to obtain a new set of capabilities that facilitate the ongoing strategic renewal of an organization's business model (Vial, 2019; Warner & Wäger, 2019; Yoo et al., 2012), and is the focus of this master thesis.

The theoretical perspective of dynamic capabilities provides a powerful lens for studying business model innovation, by explaining how organizations can adapt to changing circumstances and maintain their competitive advantage (Eisenhardt & Martin, 2000; Teece et al., 1997). Moreover, literature highlights that firms need to build strong dynamic capabilities to rapidly create, implement and reconfigure business models to remain relevant in the emergent digital economy (Karimi & Walter, 2015; Teece, 2018a; Teece & Linden, 2017). Dynamic capabilities will provide firms with the agility to digitally innovate their business model and gain a sustainable competitive advantage.

Dynamic capabilities are defined as the firm's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing business environments (Teece, 2007; Teece et al., 1997). Dynamic capabilities can be distinguished from operational or

“ordinary” capabilities, which are the routine activities, administration, and basic governance that allow any organization to pursue a given direction or a defined set of activities in an efficient manner. Above these is a layer of dynamic capabilities that “involve higher-level activities that enable an enterprise to redirect its ordinary capabilities towards high-payoff endeavours” (Teece, 2014, p. 328). Teece (2007) argues that dynamic capabilities enable firms to adapt to changes through three mechanisms: (1) *sensing* opportunities and threats, (2) *seizing* opportunities, and (3) *reconfiguring* the organization’s business model and wider resource base.

Despite the high relevance of dynamic capabilities for digital business model innovation, limited scholarly attention has been devoted to building dynamic capabilities to support business model innovation in a digital context (Schilke et al., 2018; Vial, 2019). How dynamic capabilities for digital business model innovation are built “is a paramount strategic question that is yet to be fully understood” (Warner & Wäger, 2019, p. 333). Hence, more research is needed to understand the micro processes that contribute to the development of dynamic capabilities (Schilke et al., 2018). Therefore, the aim of this research is to investigate the process of developing dynamic capabilities for business model innovation in a digital context. Hence, the following research question is proposed:

*How to facilitate firms in building dynamic capabilities for digital business model innovation?*

- *RQ1: How can business model innovation be conceptualized in a digital context?*
- *RQ2: What dynamic capabilities are needed for business model innovation in a digital context?*
- *RQ3: What interventions can be identified that enable firms to build dynamic capabilities for business model innovation in a digital context?*

This thesis addresses the research questions by identifying what dynamic capabilities are needed for digital business model innovation, and how organizations can build those. For this purpose, the design-science research method is used (e.g. Joan E van Aken, 2004; Holmström et al., 2009; Keskin & Romme, 2020; Romme, 2003). This method connects the emerging body of research to the pragmatic, action-oriented knowledge of practitioners (Romme, 2003). This study investigates how firms develop and implement digital business models from a dynamic capability lens. To clarify each research question is further elaborated.

*RQ1: How can business model innovation be conceptualized in a digital context?*

Digital technologies have influence the nature and structure of new products, services, business models, and the entire innovation process (Nambisan et al., 2017). Therefore, this research question is focussed on identifying how business model innovation can be conceptualized in a digital context. This is mainly aimed to identify what has changed in a digital era and how this affected the capabilities needed for business model innovation.

*RQ2: What dynamic capabilities are needed for business model innovation in a digital context?*

Following Teece (2007), dynamic capabilities can be conceptualized as both broad organizational capacities and critical capabilities that work together to effect organizational change. Critical capabilities specify the broad organizational dimensions of sensing, seizing

and reconfiguring and are therefore crucial when engaging in business model transformation (Achtenhagen et al., 2013; Day & Schoemaker, 2016).

*RQ3: What interventions can be identified that enable firms to build dynamic capabilities for business model innovation in a digital context?*

This question is focused on the interventions that enable firms to build the critical capabilities for digital business model transformation, which are identified in the second research question. Therefore, it is crucial to analyse and understand the determinants influencing dynamic capabilities for digital business model innovation. Interventions are strategic and organizational micro-processes that represent concrete actions and can vary from firm to firm.

The study consists of a theoretical and empirical part. The first research question is answered by conducting a narrative literature review focused on the investigation of business model innovation in a digital environment. This literature review is mainly incorporated to provide the theoretical background and the problem space for the remainder of this thesis. The second and third research questions are answered by both literature and empirical data. First, a systematic literature review is performed to provide a theoretical frame of reference. This review is focused on identifying what critical dynamic capabilities are crucial for digital business model innovation (RQ2). Thereafter, it aims to identify what interventions enable firms to build these critical capabilities (RQ3). The theory will be used to establish design principles that provide the initial guidelines for building dynamic capabilities for digital business model innovation (van Aken & Romme, 2009). The empirical part of this study is aimed at identifying what dynamic capabilities for digital business model innovation are used in practice (RQ2). Furthermore, it is aimed to extent and validate what interventions help to build these dynamic capabilities (RQ3). The empirical part of this thesis consists of a multiple case study of firms undergoing a digital transformation. This study combines data from both experts guiding digital transformations (e.g., senior consultants) and from firms undergoing a digital transformation. Qualitative data will be collected by conducting semi-structured interviews with senior consultants of strategy consultants who have extensive experience in digital transformation. Furthermore, data will be collected by investigating consultancy documents such as project reports, industry reports, and internal knowledge documents in digital transformation. This empirical study helped to identify, validate, and complement design principles previously outlined in the theoretical framework. Thereafter, the final design is validated by evaluating its use in previously indicated case studies and by interviews with consultants.

Based on a multiple case study this study maps (1) which critical dynamic capabilities and are essential for digital business model innovation (2) what interventions can help firms to build dynamic capabilities for digital business model innovation. This thesis aims to contribute to literature in three ways. First, this thesis investigates digital business model innovation from a dynamic capability lens. Empirical studies on business model innovation typically focused on external antecedents such as technology, stakeholder influence or changed value networks (Böttcher & Weking, 2020). By focusing on dynamic capabilities as internal antecedent of business model innovation, as proposed by Teece (2018a), this paper aims to elaborate and clarify the relationship between these two constructs(Teece, 2018a). As outlined by Teece (2018a), the concepts of business models, dynamic capabilities and strategy have been

understood on a theoretical level, but empirical insights are still lacking to connect the two. Thus, this study aims to contribute to the request for more empirical research in the relationship between business model innovation and dynamic capabilities (Randhawa et al., 2021; Teece, 2018a; Vial, 2019). Second, this thesis extends previous dynamic capability research by focusing on the interventions that help to build dynamic capabilities for digital business model innovation. Last, this thesis is focused on enhancing growing literature of dynamic capabilities in a relevant and understudied disruptive change process - digital transformation. As the term digital transformation has been inconsistently used to describe various strategizing and organizing activities (Warner & Wäger, 2019), this study helps to conceptualize the scope of digital transformation.

## 2 THEORETICAL BACKGROUND

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The theoretical background is aimed to explain the relating theory that support the research. Furthermore, it aims to provide an answer to the first research question by conceptualizing business model innovation in a digital context.

### 2.1 BUSINESS MODEL

The role of an organizations business model for digital transformation has been highlighted by various authors (Berman, 2012; Fitzgerald et al., 2013; Verhoef et al., 2021). The business model has gained growing consensus on how it is defined in literature (Foss & Saebi, 2017; Lambert & Davidson, 2013; Saebi et al., 2017). Generally, the definition by Teece (2010, p. 172) is followed, who states that “a business model describes the design or architecture of the value creation, delivery, and capture mechanisms a firm employs.” Although different terminology is used for the components of a business model, generally three main categories are distinguished (Osterwalder & Pigneur, 2010; Schön, 2012): (1) value proposition (product & services, customers, geography), (2) revenue model (pricing logic, channel, interaction), and (3) cost model (core assets & capabilities, core activities, partner network). For effective business models, it is important that each element of the business model is internally aligned and coherent (Ritter, 2014). Additionally, a company’s business model must be aligned with its internal structure and overall management model (Birkinshaw & Ansari, 2015). While business models are a complex and multidimensional concept (Schallmo et al., 2017), this thesis focusses on how companies build dynamic capabilities for digital business model innovation.

### 2.2 BUSINESS MODEL INNOVATION

In addition to this rather static perspective of business models, literature has increasingly highlighted the dynamic and transformational approach on business models, which focusses on changes in business models (Demil & Lecocq, 2010). In general, business model innovation is defined “(...) as the process by which management actively alters the intra-organizational and/or extra-organizational systems of activities and relations of the business model in response to changing environmental conditions.” (Foss & Saebi, 2015, p. 148). Literature about business model innovation can be commonly classified into four main categories (Foss & Saebi, 2017). Namely, (1) conceptualization and classification of BMI, (2) BMI as organizational change process, (3) BMI as outcome, and (4) consequences and organizational performances of BMI. This study solely focusses on the second research stream that describe BMI as organizational change process, which is focused on the capabilities, leadership and learning mechanisms needed for successful BMI (e.g., Achtenhagen et al., 2013; Demil & Lecocq, 2010; Frankenberger et al., 2013; Mezger, 2014).

Additionally, Foss & Saebi (2017) have further subdivided the process perspective of business model innovation by (1) the stages of the BMI process, (2) the organizational capabilities and processes to support this change process, (3) the importance of experimentation and learning, and (4) practitioner-oriented tools for managing the process. This study only concentrates on the second research stream which is focussed on identifying the different organizational capabilities and processes required to support business model innovation.

### 2.3 DYNAMIC CAPABILITIES AS EMERGING APPROACH FOR CHANGE

Engaging in BMI, independent of scope, requires organizations to adapt, acquire, renew, or build new resources and competences or (re)combine exiting ones to fulfil future needs (Amit & Zott, 2001). In order to build an organization that can digitally innovate its business model, this study builds on the premise that companies need to develop dynamic capabilities specifically for digital business model innovation. In contrast to research which considers BMI as a distinct dynamic capability (Mezger, 2014), this thesis follows the majority of scholars (Day & Schoemaker, 2016; Fallon-Byrne & Harney, 2017; Foss & Saebi, 2015) who argue that business model innovation is an outcome of dynamic capabilities which “undergird how firms create and capture value” (Foss & Saebi, 2015, p. 28). The introduction of dynamic capabilities by Teece et al. (1997), has since then provided a powerful lens in examining strategic change of organizations (Agarwal & Helfat, 2009; Barreto, 2009; Schilke et al., 2018). Dynamic capabilities are defined by the firm’s ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing business environments (Teece, 2007; Teece et al., 1997).

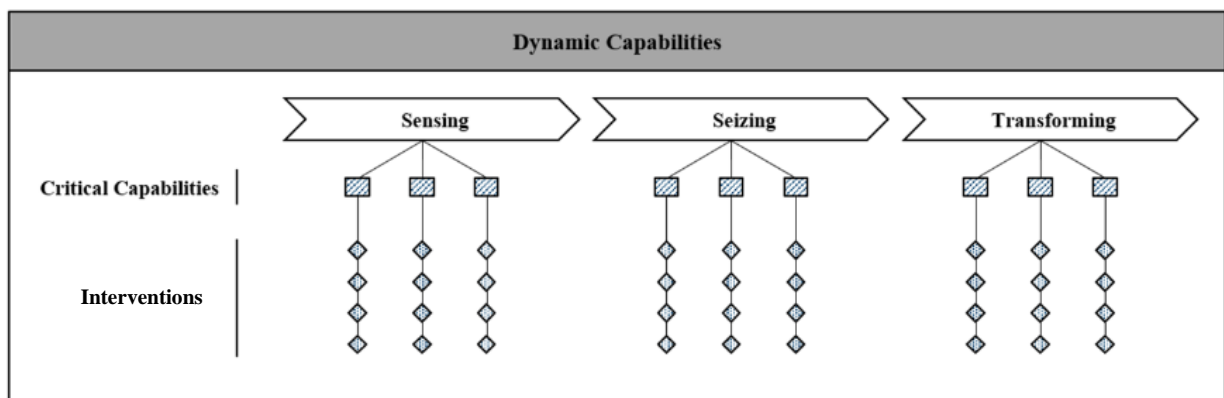


Figure 2 Conceptualization of dynamic capabilities

The concept of dynamic capabilities can best be explained in the context of an organization’s overall portfolio of capabilities, which can be thought of as working on in two levels (Winter, 2003). At the base level, there are operational or ‘ordinary’ capabilities, which are the routine activities, administration, and basic governance that allow pertain to the current operation of an organization. Above these is a layer of dynamic capabilities which can be divided into critical capabilities (i.e. microfoundations) and higher-order capabilities (Teece, 2007). Critical capabilities are characterized by distinct skills, processes, procedures, organizational structures, decision rules, and disciplines that undergird the dynamic capability themselves (Teece, 2007). Critical capabilities are focused on redirecting existing ordinary capabilities towards higher-payoff endeavours as well as the development of new capabilities (Teece, 2014).

All together these are guided by higher-order dynamic capabilities by which management senses opportunities and threats, seized new opportunities by deunvising business models, and reconfiguring its organization accordingly. An overview of the hierarchical levels of dynamic capabilities is displayed in table 1.



Table 1 Hierarchical levels of dynamic capabilities

	Description	Example
Higher-order dynamic capabilities	Dynamic capabilities are defined by the firm's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing business environments	Sensing, seizing, reconfiguring
Critical capabilities	Distinct skills, processes, procedures, organizational structures, decision rules, and disciplines, but are also endorsed by non-routine managerial interventions	New product development, expansion into new sales regions, agile decision making, and other activities that constitutes sensitive managerial decision making under uncertainty
Zero-order dynamic capabilities: Operational & ordinary capabilities	Routine activities, administration, and basic governance that allow pertain to the current operation of an organization	Procurement, finances, supply chain, publications, communication

## 2.4 DIGITAL BUSINESS MODEL INNOVATION MANAGEMENT

From an innovation perspective the impact of digital technology on an organization has mainly been conceptualized in the field of information systems, where research has paid attention to the adoptions and use of digital technologies and their resultant business value (e.g., Nambisan et al., 2017; Sambamurthy et al., 2003). Yoo et al. (2010) describe three unique characteristics of digital technology that are rooted in (1) reprogrammability, (2) homogenization of data, and (3) self-referential nature of digital technology. As a result, the characteristics of digital technologies pave the way for a layered modular architecture creating implications for digital innovation and digital strategies (Yoo et al., 2010).

Nambisan (2017) distinguish three distinct business outcomes of emerging digital technologies: (1) digital artifacts, (2) digital platforms, and (3) digital infrastructures. First, digital artifacts offer innovative solutions by combining existing physical products with embedded digital capabilities which are programmable, sensible, traceable, communicable, memorable, addressable, and associable (Yoo, 2010). This separates form from function and allows organizations to modify and enhance functionalities after production at negligible costs (Huang et al., 2017). Second, an important outcome of digital innovation is the emergence of digital technology platforms as the central focus of firms' innovation activities (Yoo et al., 2012). Digital platforms comprises the technology, applications and data that powers a company's business processes and acts as a foundation upon which firms can develop complementary products, technologies, or services (Gawer, 2009). The role of digital platforms for innovation can be seen from two perspectives (Yoo et al., 2012). From one perspective, digital platforms support a firms innovations strategy by forming an ecosystem with actors and by supporting the proliferation of digital tools and components (Yoo et al., 2012). These are often orchestrated by platform leaders (e.g., Uber, Airbnb, Apple IOS) and form complex configurations of heterogenous actors (Nambisan et al., 2017; Yoo et al., 2012). Another perspective shows that

digital platforms with persuasive digital technology can supports the proliferation of digital tools and components, allowing firms to build digital capabilities throughout the organization to support several functions (Yoo et al., 2012). Digital platforms handle end-to-end business processes through technology, applications and data to improve the experience of customers, employees, and partners (de Reuver et al., 2018). Third, digital infrastructures such as social media, data analytics, cloud computing and 3D printing provide digital native firms with new tools for rapid scaling and accelerated growth (Huang et al., 2017). In recent years 'digital native' organizations such as Google, Amazon, and Facebook have grown into powerful "behemoths" and created a "new generation of competition" that has put the survival of incumbent firms under threat (Sebastian et al., 2017; Teece & Linden, 2017).

In addition to innovation outcomes, the emergence of digital technologies also proposes implications for an organizations innovation processes (Nambisan et al., 2017). Previous studies have indicated that digital business model innovation is frequently described as more complex than conventional business model innovation (Bonnet & Westerman, 2021; Nambisan et al., 2017; Sorescu, 2017). Nambisan (2017) argues that the digitalization challenges three key assumptions in traditional innovation processes. Digital innovation processes are characterized by (1) less bounded innovation outcomes, (2) more interaction between innovation processes and outcomes, and (3) distributed innovation agency (Nambisan et al., 2017). First, previous research in innovation management have generally assumed a fixed set of boundaries and features for new products or services that underlies a market opportunity (e.g., Ulrich & Eppinger, 2011). The use of popular innovation methods such as stage-gate testify this. However, as explained in the previous paragraph, innovation outcomes such as digital artifacts, platforms, or infrastructures continue to evolve after they have been launched or implemented. For example, embedding digital artifacts in product offerings result in solutions that are malleable, editable, open, transferable (Yoo et al., 2010), which allows to continuously change the scope, features and value of digital offerings even after it has been launched. Therefore, most digital solutions remain somewhat incomplete and in a state of flux (Hanseth & Lyytinen, 2010; Lyytinen et al., 2015). Thus, the boundaries of digital innovation, be it a product, platform or service, imparts an unprecedented level of unpredictability and dynamism. Therefore, the boundaries of what is or is not an innovation outcome have become more porous and fluid. Secondly, innovation processes, in addition to outcomes, have also become less bounded and more continuous. While conventional business model innovation results in business models that usually remain relevant for several years, digital business model innovation is often characterized as a continuously development process. The constant changing nature of digital technologies is inherent in digital business models and creates a cycle of iterative experimentation and implementations, making it unclear when a particular innovation process starts or ends, or whether the results of the innovation are 'final' (Nambisan et al., 2017). For example, new digital infrastructures (e.g., 3D printing, rapid prototyping, digital twins etc.) enable product ideas to be rapidly formed, established, modified and reproduced through iterative cycles of experimentation and implementation (Ries, 2011). Therefore, digitalization helps to breaks down boundaries between different innovation phases and creates more overlap and complexity in their time horizons. Third, digital innovation is shifting to less predefined and more decentralized innovation agencies, especially in technology intensive industries (Nambisan et al., 2017). This shift has been referred to as distributed innovation (Yoo

et al., 2012), open innovation (Chesbrough, 2003), and network-centric innovation (Nambisan and Sawhney 2007). Advanced innovation technology has reduced cost of communication and coordination leading to a geographical dispersion of innovation activities (Yoo et al., 2012). A decentralized innovation agency is an innovation context in which a dynamic and often unexpected collection of actors with diverse goals and motives – often outside the control of the primary innovator- participate in the innovation process (Bogers & West, 2012). These ecosystems are highly dynamic in actors and composition and can easily change based on objectives, competences needed, new constraints or opportunities, motivations shift, or complementary capabilities (Lusch & Nambisan, 2015). Furthermore, information technology have also distributed the control of innovation across multiple organization, leading to a more “democratized” innovation process (Yoo et al., 2012). Regular involvement of loosely organized crowds and other new external stakeholders in the development of digital BMI challenges general norms and the protection of intellectual property (Teece, 2018b; Yoo et al., 2012). This decentralized nature of digital business models, leaves room for potential outsiders to behave opportunistic for some elements, which places additional stress on risk management and leadership capabilities (Bonnet & Westerman, 2021; Soluk et al., 2021). With regard to capturing value “strategy becomes vastly more complex as firms consider dynamic interactions of a multi-layered ecosystem” (Parker & Van Alstyne, 2014, p. 5). Moreover, advanced insights of digital markets and customers facilitate complex external interactions in emerging ecosystems (Teece, 2018b).

In summary, the digital era calls for new designs of effective governance, collaborative structures and flexible mechanisms to successfully develop and deploy new digital offerings (Nambisan et al., 2017).

## 2.5 DYNAMIC CAPABILITIES FOR BUSINESS MODEL INNOVATION

As described in the previous paragraph, dynamic capabilities provide a powerful lens to describe organizational change processes, such as business model innovation. In the broader context of strategic change, the dynamic capability framework of Teece (2007) is often followed. 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). In this study these broader categories are further specified based on literature in the field of business model innovation. In recent years, this research stream has emerged and helped to conceptually and empirically link business model innovation and dynamic capabilities (Achtenhagen et al., 2013; Fallon-Byrne & Harney, 2017; Foss & Saebi, 2018; Mezger, 2014; Teece, 2018a). Based on this research, six higher-order dynamic capabilities are identified, specifically for business model innovation (table 2). Each dynamic capability is further elaborated in the paragraphs below.

Table 2 Dynamic capabilities for business model innovation

Sensing	Seizing	Reconfiguring
<u>Business model sensing</u> : The ability to continuously identifying, experimenting with and exploiting of new business models	<u>Develop business models</u> : The ability to operationalize market, technology and business model knowledge through learning and experimentation	<u>Orchestration</u> : The ability to source and select new processes, resources, and competences to support new processes
<u>Technology sensing</u> : The ability to acquire new, emerging technological know-how and relate this knowledge to specific business model components	<u>Coordinate BMI</u> : The ability to configure, combine and mix each of these business model components to develop complementary value propositions	<u>Integration</u> : the ability to align activities, resources, capabilities and investments with partners in addition to facilitate internal coordination

### 2.5.1 Business model sensing

Firms need sensing capabilities to scan the external environment for unexpected trends that could disrupt the organizations (Birkinshaw & Ansari, 2015; Day & Schoemaker, 2016; Helfat & Raubitschek, 2018; Teece, 2007). Teece (2007, p. 28) has defined sensing as "sensing and shaping new opportunities (and threats) is very much a scanning, creation, learning, and interpretative activity" that analyses various sources and trends about the business ecosystem. This includes scanning and monitoring technological developments and assess customer needs.

When sensing business models opportunities it important for a firm to recognize alternative business model configurations at competitors and across industry boundaries (Mezger, 2014). An initial step is to sense for latent customer needs who are willing to pay for product of service improvements (Teece, 2018a). Firms need to proactively engage in market research to systematically analyse business models of competitors, adjacent firms, other markets. This requires firms to strategically focus on business model innovation and explicitly scan and evaluate potential of business models in leading industries (Mezger, 2014). As Teece (2018a) states, business models are more context-dependent than technologies, it takes more time for business model to catch up on technological possibilities. Incumbent firms are therefore more likely to innovate their business model incrementally, so it is more in line with their current operations. The possibility to selecting 'new' business models, depends in part on the strength

of the firm's dynamic capabilities (Teece et al., 2016). However, in highly competitive markets inventing completely new business models is rather unlikely.

#### **2.5.2 Technology sensing**

Truly new business models are periodically enabled by technological innovation. Hence, firms need to ability to acquire new, emerging technological know-how and relate this knowledge to specific business model components (Achtenhagen et al., 2013; Mezger, 2014; Teece, 2018a). A firms existing knowledge and technical capabilities contribute to a firm's ability to leverage this knowledge for identifying new business models. Furthermore, firms 'technical sensing capability' enables organizations to identify new business model opportunities arising from technological developments. However, firms with multiple and institutionalized links with external technology resources, regardless of their initial knowledge base, can better identify opportunities for new business models (Mezger, 2014).

#### **2.5.3 Develop business models for seizing**

Firms need to systematically develop and design business models by combining technology, market and business model knowledge (Mezger, 2014). Furthermore, firms need to have the ability to operationalize customer insights though continuously identifying, experimenting with and exploiting of new business model (Achtenhagen et al., 2013; Mezger, 2014). This provides firms insights into how customers perceive new business models and allows firms to advance new business model ideas rather quickly and purposefully (Mezger, 2014). Therefore, organizational processes should provide members of teams the freedom to develop and experiment with new business models as part of their job.

Furthermore, several studies highlight the strong interaction and iteration between sensing and seizing (Mezger, 2014; Teece, 2010; Zahra, 2008). Iterative processes are meant to test the alignment between new business models and potential technologies, customers, and market considerations. Therefore a learning-driven approach is suggested by moving back and forth between sensing and seizing (Mezger, 2014).

#### **2.5.4 Coordinate business model innovation for seizing**

Regarding seizing, innovation activities should be focused on configuration of the entire business model (Mezger, 2014; Teece, 2018a). With the many opportunities for new products and services identified with the sensing capability, organizations need to configure, combine and mix each of these business model components to develop complementary value propositions. Business model components are not perfectly modular, changing one can entail changes in many others (Teece, 2018a). For example, changing from third party selling to direct distribution will shift in-house activities from supplier monitoring to shipping functions and customer interaction. Therefore, firms need to adapt a comprehensive scope of the entire business model to their innovation process instead of thinking separately in terms of product innovation, adaptation of product-market strategies, or new marketing concepts (Mezger, 2014). So, for the development of new business models, organizations (and individuals) need the ability to combine technical, market and business model knowledge.

Furthermore, strategic alignment has been indicated to play a crucial role for business model innovation (Achtenhagen et al., 2013; Casadesus-Masanell & Ricart, 2010). As each element of the business model needs to be aligned, the same is true for the alignment between an

organization's strategy and its business model (Rumelt, 2012). Strategic analysis is an essential step when designing a competitive business model, getting both right is critical to capture value (Teece, 2018b).

#### **2.5.5 Orchestration capabilities for reconfiguring**

After a firm has identified potential opportunities and developed new business models exploit these opportunities, organizations need to reconfigure their activities, structures and resources. Reconfiguring capabilities are especially important for incumbent organizations as they start with an already established resource base (Teece, 2007).

First, organizations need to reconfigure their value chain and their value capturing mechanisms. When implementing new business models firms need to rethink the system of activities that helps them to create and deliver value (Zott & Amit, 2010). New business models often impact the production and distribution process. Therefore, firms need the ability to evaluate and select these new processes, implement changes for this process and build up new resources, competences and assets to support these processes. This requires organizations to use its resources in a balanced way (Achtenhagen et al., 2013; Mezger, 2014). As uncertainty for new business models is rather high, determining which new resources and competences are strategically relevant is a complex issue. Therefore, firms have implemented structures and processes to deal with these uncertainties and (high) investments in technological skills, assets and resources (Mezger, 2014). This refers in particular to a firm's ability to select whether to build capabilities internally or externally. These 'make or buy' decisions have important implications for firms, as controlling bottleneck assets is critical when capturing value (Teece, 1986). When a company decide to build up certain resources and skills in-house, these competences are likely to represent a fundamental component of the new business model. Developing internal competences can for example be achieved by systematising exploratory learning in new technologies. For this reason, firms invest in employee training programs and establish specific routines that encourages employees to gather new or exchange knowledge internally. Besides learning mechanisms, firms also invest in the recruitment of new employees with technological background, previous experiences in relevant subjects, or relevant personal networks.

#### **2.5.6 Integration capabilities for reconfiguring**

Critical when reconfiguring business models is a firm's ability to align activities, resources, capabilities and investments with partners in addition to facilitate internal coordination. Especially when business models involve 'systems' and 'networks', integrating know-how from both inside and outside the company is critical to success (Teece, 2007). The term integration capability encompasses the externally-oriented concept (e.g. relational capabilities), as well as the concept of internal integration capabilities (Helfat & Raubitschek, 2018). Internal integration capabilities, in particular, refer to a company's capacity to effectively communicate and coordinate actions, resources (including knowledge) and capabilities, investments, and objectives within the firm (Helfat & Campo-Rembado, 2016).

Furthermore, when realizing new business models, is not possible nor necessary for the focal firm to own all resources and competences (Amit & Zott, 2001). In fact, new business models rely heavily on the application of new technologies with high uncertainties, so collaborating

with partners helps to mitigate investment risks (Tripsas, 1997). Therefore, A way to obtain competences and resources is by integrating and collaborating with partners that possess complementary business model components (Chesbrough, 2010). A great example is given by cloud computing, which offer companies infrastructure-as-a-service to help organizations free their operations from maintaining servers and data centres. To summarize a capability-based conceptualization for business model innovation is displayed in table 2.

### 3 RESEARCH METHOD

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This chapter describes the research methodology of this thesis. For this thesis a design science approach is adopted. This approach is used in an attempt to bridge the gap between theory and practice and solve real-world challenges practitioners are facing.

#### 3.1 RESEARCH DESIGN

For this thesis, the design science methodology is followed (e.g. van Aken, 2004; Holmström et al., 2009; Keskin & Romme, 2020; Romme, 2003). This method focuses on developing design principles that serve as guidelines for configuring a solution for a problem in a specific context (van Aken & Romme, 2009). Design principles ‘involve a coherent set of normative ideas and propositions, grounded in research, which serve to design and construct detailed solutions’ (Van Burg et al., 2008, p. 116). Design principles form both input and output as it involves using theory-based principles to develop a conceptual solution in a real-life context, which is subsequently testing underlying design principles and/or deriving new ones on the basis of new insights which were not to be found in literature (van Burg et al., 2012).

In this thesis, the design principles are aimed at the development of framework to facilitate firms in building their dynamic capabilities for digital business model innovation. The process of formulating design principles is structured by developing principles based on scholarly knowledge (research-based principles) and principles merely based on practice (practice-based principles). The synthesis of these principles results in final design principles. This research-design-development cycle is conceptualized by Keskin & Romme (2020) in four iterative steps which are used for this study.

First, the *exploration* phase first revolves around defining the boundaries of the problem space. To achieve this, explorative interviews were conducted with strategy consultants active in digital transformation projects. During these interviews the initial challenge of developing internal drivers for digital business model innovation was identified. Furthermore, an explorative literature search was carried out to collect theory revolving around the problem space. This eventually resulted in the problem definition which led to the formulation of a research proposal and the research questions. After the problem has been defined, it was further explored, analysed and validated by investigating its components. Initially a narrative literature review was conducted with the primary focus on conceptualizing business model innovation in a digital context (RQ1) and to provide the theoretical background for the remainder of this thesis. Furthermore, insights and assumptions were validated with practitioners through observations, experts interviews and by analysing company documents describing frameworks, processes, and workflows for digital business model innovation.

Following the initial conceptualization of digital business models and its accompanied components, a systematic literature review has been performed to explore theoretical perspective and their underlying mechanisms. This theoretical review aims to provide a theoretical framework for the second and third research question. First, focused on identifying what dynamic capabilities are needed for digital business model innovation (RQ2). Thereafter, it has concentrated on the interventions that enable firms to build these dynamic capabilities



for digital business model innovation (RQ3). This theoretical framework is later used in the synthesis phase to establish theory-based design principles (van Aken & Romme, 2009).

The next step in the design science cycle is the *synthesis* stage. This step is mainly focused on formulating design principles that defining which dynamic capabilities are desired for digital business model innovation and how firms can obtain them. Furthermore, this step is aimed at making sense of dynamic capabilities which tend to vary largely in their nature, role, and context (Barreto, 2009). During synthesis, the research information gathered in the previous step was merged into design principles. These design principles were formed using the CIMO logic (Denyer et al., 2008). In this way of formulating principles, there is a context (C) in which a mechanism operates (M), affected through an intervention (I), to aim for a desired outcome (O). Next to a theoretical analysis, an empirical analysis is performed to derive practice-based design principles. This empirical analysis is done through semi-structured interviews with experts in the field of digital transformation (i.e., senior strategy consultants in digital transformation) to indicate what dynamic capabilities are important from a practitioner's point of view. This analysis leads to a list of practice-based design principles focused on dynamic capabilities for digital business model innovation.

The *create* phase focuses on designing interventions (i.e., generic and/or particular solutions) that help to build dynamic capabilities for digital business model innovation. Here, the main goal is to identify how an intervention is contributing to the desired outcome defined in previous steps. During this phase, again several semi-structured interviews were held with consultants to indicate what methods they use to help organizations with their digital business model innovation. Furthermore, this step is enhanced by analysing consultancy company with methodologies and guidelines for digital transformation. Eventually, the create phase result in the development of framework to facilitate firms in building their dynamic capabilities for digital business model innovation.

The last phase described in the design science cycle is the *evaluation* stage. As mentioned in previous steps, evaluation did not merely take place at the end of the project. Expert input was provided on different aspects of the project during several moments. This resulted in the iterative development of the requirements, design principles, as well as the solution design. Ultimately, the eventual tool is empirically validated by applying it in several digital transformation projects as a case study. This interactive evaluation is used to redefine the tool and identify what interventions are actually used in digital transformation projects to build dynamic capabilities for digital business model innovation.

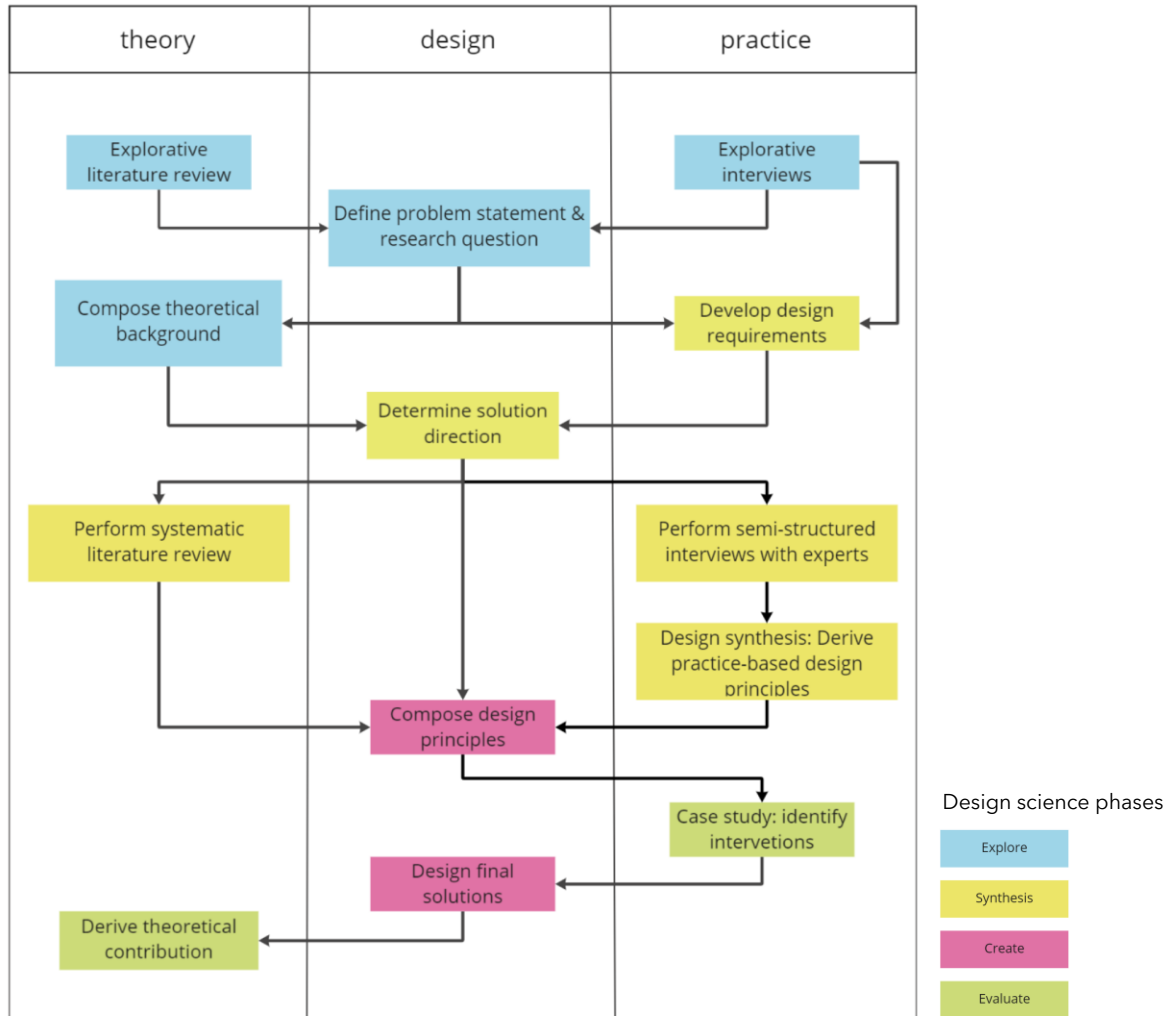


Figure 3 Research diagram

### 3.2 SYSTEMATIC LITERATURE REVIEW

This systematic literature review is aimed to provide a theoretical perspective regarding dynamic capabilities in a wider digital context. The digital contexts that have been analysed for this review are *digital business model innovation, digital transformation, digital platform innovation, and digitalization*.

The conducted systematic literature review involved the following five steps:

*Step 1:* The keywords from deducting this systematic review were deducted from the previous described theoretical background in chapter 2. The terms are operationalized in six key constructs: *dynamic capabilities, capabilities, digital business model innovation, digital transformation, digital platform innovation, and digitalization*. The final key constructs, keywords and search query can be found in in Appendix B.

*Step 2:* Through a systematic review several quality criteria to include or exclude certain publications were formulated. To guarantee quality and to reduce the sample to a manageable

amount, only peer-reviewed academic journal papers in English language were included we followed other scholars and concentrated on peer-reviewed academic journal papers in the English language (e.g. Seuring & Müller, 2008). No limitation regarding the time frame was adopted. The focus on the literature review is to derive 'dynamic capabilities in a digital context' and therefore concentrates on papers that formulate these. Furthermore, the literature review is aimed to focus primarily on digital business model innovation, while also including papers focused on digital transformation, digital platform innovation, and digitalization when deemed relevant.

*Step 3:* After the quality criteria were determined the search query could be executed. The review includes only results from research databases ProQuest due to its focus on relevant academic and corporate research. From the total number of 128 articles, 67 papers were selected based on a review of their title. Thereafter papers were selected based on their abstract, which resulted in a final selection of 50 papers that are indicated as relevant for this research. Besides the results of this systematic approach 23 papers were added that were already used in an earlier stage of the project and fit the criteria. This resulted in a total of 73 papers that were reviewed.

*Step 4:* The data was extracted from the papers. The topics that were extracted: title, author, topic of the paper, context, critical capabilities and key activities. This resulted in a table overview of the dynamic capabilities that were addressed per paper.

*Step 5:* Based on the dynamic capabilities derived from the literature review most relevant capabilities and articles were selected for each category (e.g., sensing, seizing, reconfiguring). This results in a comprehensive overview of dynamic capabilities that are relevant for digital business model innovation. These results are displayed in Appendix C.

### **3.3 CASE STUDY**

For the purpose of this research a multiple case study is conducted at 5 case companies. First, the case selection criteria are discussed. Thereafter a description is provided of each case. Third, the data collection method is described. Lastly data analysis is described.

#### **3.3.1 Case selection**

The objective of this study is to holistically understand the phenomenon of building dynamic capabilities for digital business model innovation. The case study approach aims to provide a deeper understanding of the dynamic in a particular setting and provide insight into the unexplored concerns in literature (Eisenhardt, 1989). The following objectives are identified for the case study of this research:

- Identify dynamic capabilities that are necessary for digital business model innovation (RQ2)
- Validate and/or enhance theoretical-based dynamic capabilities for digital business model innovation (RQ2)
- Identify what interventions enable firms to build dynamic capabilities for digital business model innovation? (RQ3)

For the purpose of this thesis the sampling method for the case-selection is through purposive sampling and judgmental sampling, which is a non-probability sampling method, where the sample is chosen based on a set of prerequisite criteria (Easterby-Smith et al., 2002; Malhotra & DF, 2007). This sampling method is mainly suitable when the study is not directed at a large population, when time and cost are a concern, and when the purpose of the study is of an exploratory nature (Malhotra & DF, 2007). Therefore, this study has focused on case companies with the following criteria:

- Undergoing a digital transformation and therefore also taking steps to innovate their business model
- Case companies have to operate in the commercial sector (i.e. not public)
- The case companies meet the requirement of being an 'enterprise', which entailed having more than 1000 employees and operating in more than 1 geographic market.
  - This because this study is aimed to investigate large companies and particularly explore how digital transformation has affected their business and what capabilities are developed to adapt to this changing business environment.
- The case company is an incumbent firm, meaning it has already established its presence in the industry.

### 3.3.2 Case description

For each case their efforts with respect to digital business model innovation are described below. An overview of the interventions that were used by each case company is displayed in Appendix D.

#### ***Case 1: Consultant1***

Consultant1 is an internationally leading innovation and transformation consultancy with a diverse range of services in the areas of Strategy, Digital, Business Design, Agile, Business Intelligence & Analytics and IT Transformation. They employ more than 2,600 strategists, consultants, technologists, innovators and industry experts worldwide, spread over 25 countries and working in 9 market sectors. In the Netherlands, this sector focus is mainly on Financial Services, Manufacturing, Transport and the Public Sector. Consultant1 believes in the power of ingenuity and has a strong focus on technology. Their consultancy practices are being supported by scientists, technicians and engineers who work from their unique technology center. They deliver end-to-end innovation by developing and creating completely new business models for their clients. Their clients mainly consist of large incumbent organizations.

#### ***Case 2: Financial1***

Financial1 is operating in the financial market which has already undergone a large digital transformation. Initially there were mainly 'fintech' start-ups that developed financial services with disruptive technologies, nowadays large financial organizations are often in the lead. Innovation within Financial1 is primarily, if not only, focused on digital technologies. Several disruptive technologies range from AI, ML, blockchain, or identification software, in which data has a large role.

Financial1 is running multiple innovation centres across the business units, to hold a close relationship with local market and clients. To maximize the combined efforts, all distributed

innovation centres are connected to a central transformation entity. The transformation office wants to improve and accelerate the innovation operating model. To ensure the quality, alignment, strategy and progress of there is an overall innovation management program that seeks to bring innovation to the next maturity level and increases the impact it makes. To do so several steps are taken. First, Financial1 needs to drive innovation accounting instead of financial accounting. Although clear targets were already defined, the defined end result resulted in the risk of premature scaling before the right business model is validated with sufficient evidence. Requiring a business plan during the early stages of idea development creates the risk of failure, because leadership buys into a financial plan rather than a validated opportunity based on Lean metrics. Second, as multiple business strategies were steering on different years creating unclarity in guiding the direction of innovators. This provided the opportunity for transformation office to create a powerful innovation strategy, setting the direction for innovation across the firm, contributing to realizing impact on Financial1 strategy with innovation. Third, to do so, the transformation office needed to explore ways to manage propositions as a venture fund. Innovations were steered in separate pockets as a project organization, limiting entrepreneurial behaviour and competition amongst propositions. This also led to traditional project management control rather than innovation control, focusing on uncertainty and high risk. Fourth, to measure the efforts of innovation, Financial1 has implemented a unified stage-gate process across the transformation office, to be able to take decisions at higher speed, execute innovation more quickly and benchmark the portfolio. Lastly, all these activities are supported by the right organizational structure, governance mechanisms and job profiles. The ambition is to establish high-performing innovation teams that have the agility of start-ups and use the power of the corporate, to be able to go more quickly from idea to validated MVP and from MVP to scaling.

### ***Case 3: Financial2***

Financial2 has set innovation as key priority and has invested in innovation over the last couple of years. Initially their innovation was technology driven and organized in separate units away from the business. To improve so they have created a new innovation model to become more business driven. They have aimed to achieve this by implementing an innovation board that governs innovation budgets and efforts. Furthermore, business lines are supported by a centre of excellence that provides ways-of-working, methods, tools and resources to accelerate innovation. Lastly to improve their innovation effectiveness they have streamline the process and improve design, governance and alignment between innovation & strategy. This eventually resulted in an innovation engine that was capable for digital growth.

### ***Case 4: Recruitment1***

The company was under great pressure due to digital disruption and a competitor's landscape that is evolving at great speed. Simple cost cutting was no longer considered enough, therefore they aim to take action by setting a digital strategy and increasing the pace of change. The core of Recruitment firms' digital strategy is to leverage the best HR technologies available and give clients, candidates and consultants access to tools and solutions that will help them realize their true potential and make their lives easier. In addition, it is aimed at helping both clients and candidates to stay relevant in a fast-changing digital world that increasing requires new and different skills. In that respect, technology is never a goal in itself, but always a mean to an end.

That is why they focus on combining digital solutions with services that best fit Recruitment1 culture and core values.

To realize this strategy the company has launched an Innovation Fund, which invests in promising start-ups in HR technology. Furthermore, they have also set up a 'Digital Factory', which focusses on scaling up the best technologies from both inside and outside the company as quickly and efficiently as possible. This rollout method is based on an agile and lean start-up approach. Multifunctional teams work in short development cycles on the basis of feedback provided by clients and candidates. In this way, new tech tools and solutions can be quickly implemented while they are being continuously improved. As soon as the solution is working well locally, it is scaled up globally as quick as possible.

The application landscape of Recruitment1 is a balanced mix of best-practice global and local elements. In essence, digital innovation combines external opportunities identified by the investment fund with existing local innovation, which the *digital factory* turns into global applications. The *digital factory* subsequently helps local sub organizations to implement these solutions, ensuring they are adapted to local concepts and needs, and comply with specific regulatory environments. Once implemented, global platforms may again be optimized and extended locally. These activities resulted in a global strategy suitable for a highly federated company.

#### **Case 5: Engineering1**

Engineering1 is a large international organization providing engineering, technical and construction services. Due to the lack of digital advancement in this sector, Engineering1 together with 'traditional' competitors are already facing major disruption to their long-established service lines and business models. Therefore, they need a bold ambitious digital vision. Some traditional competitors have already made inroads into digital, but none have been able to scale beyond certain pilot projects to date. Therefore, digital is a strategic enabler to 'challenging today. Reinventing tomorrow'. By adopting digital as a mean, Engineering1 aims to pivot from solving individual customer problems to become the global market leader in solving sector wide problems, by creating a more connected and sustainable world. For Engineering1, digital transformation is aimed at thriving in a digital economy through new business models, organization and culture, new ways of working (such as design thinking, Lean Start-up and Agile methodologies) and new technologies and data analytics techniques to develop solutions, create value and transform outcomes for our customers (both internal and external), our investors and society at large.

As indicated, developing new business models has been addressed as key pillar for their digital transformation. For the development of new digital business models Engineering1 faces several challenges. First, although people have the ambition to develop digital solutions, however the organizational structure and governance do not support growth with digital solutions, e.g. no go-to funding for scaling or solution sales capability. Second, their innovation has a fragmented approach, but there is currently no clear vision or unifying strategy that sets these initiatives up for success. Third, there is a lack of deliberate opportunity-mining and flexing of the risk appetite, for example to exploit the potential of Engineering1's leading position in several digital fields. Lastly, Engineering1 lacks a clear tactics and capabilities for the

development of solution sales. Engineering1 is missing a trick by not integrating digital consultancy in its engagement to drive solution sales.

Through the Innovation Program, Engineering1 has made significant steps in stimulating the discovery of new solutions. It now needs to drive success in scaling and commercialization. This should be a key role of the Digital Centre of Excellence: supporting scaling and commercialization. In addition, Engineering1 aims to submit a steady flow of validated opportunities into the Innovation funnel. Critical success factors in their approach are: (1) technology platform that enables efficient and cross-market product and platform development, (2) executive Incentives/KPIs across the organization to promote solution development, collaboration and sales (3) supportive accounting and contract processes across the organization, and (4) adequate risk tolerance.

### 3.3.3 Data collection

Over a period of 6 months, a wide range of data is collected from semi-structured interviews, project documents (i.e., consultancy reports), and internal knowledge documents. For the purpose of data collections, the author of this thesis worked from October 2021 till June 2022 as an intern at an innovation and transformation consultancy firm, specialized in digital transformations. This internship role provided opportunities to interact with (senior) consultants who have extensive experience in guiding digital transformation projects. Furthermore, it provided access to consultancy reports from firms undergoing a digital transformation as well as internal knowledge documents with methodologies and guidelines for digital transformation.

As explained in the research design, data is collected from several sources. First by deriving theory-based design principles using a systematic literature review (see paragraph 3.5). Second, empirical data of the multiple case studies was collected by following two iterations. First, data is collected by conducting semi structured interviews with consultants from an innovation and transformation consultancy firm. This data collection is focused on identifying what capabilities consultants identify as essential for digital business model innovation. The interview protocol is displayed in Appendix A. Additionally internal knowledge documents with methodologies and guidelines for digital business model innovation were analysed. This has led to an initial configuration of practice based-design principles and an initial framework design. Thereafter, another iteration of data collection is done by performing semi-structured interviews with consultants focussed on the four case companies undergoing a digital transformation. These interviews were aimed to identify what methods are used by organizations to enhance the earlier identified dynamic capabilities. Besides, advisory documents were analysed that contain the plans and methods used for their digital transformation.

#### *Overview of participants*

Table 3 presents the list of participants and allocates pseudonyms to maintain the confidentiality of each participant.

*Table 3 list of participants*

<b>Participant</b>	<b>Position</b>	<b>Case</b>	<b>Area of expertise</b>	<b>Experience</b>	<b>Major industry focus</b>	<b>#interviews</b>	<b>Interview duration</b>
Participant A	Consultant Analyst	Consultant1	Digital transformation	2 years	Financial	1	55 min
Participant B	Partner	Consultant1	Global Financial Services Innovation & Platform Leader empowering Banks, Insurers and fintech scaleups to achieve sustainable growth by: - Developing Innovation Growth strategies - Designing innovation Portfolio Strategies - Creating powerful Transformation strategies to grow new innovation/platform capabilities - Design new Platform Business model, from strategy to innovation and scale - Design, developing Corporate Venture Capital strategic programs	20+ years	Financial	1	20 min
Participant C	Partner	Consultant1	Technology & digital enabled business transformation	16 years	Transport	1	47 min



Participant D	Managing Consultant	Consultant1	Expert in business process and application landscape redesign in complex manufacturing industry	24 years	Consumer & Manufacturing	1	60 min
Participant E	Managing Consultant	Consultant1	Management consulting, Digital strategies, Innovation, and the latest technologies	15 years	Consumer & Manufacturing	1	83 min
Participant F	Principal consultant	Financial1	New Growth & Innovation Expert	9 years	Financial	2	70 min
Participant G	Principal consultant	Consultant1	Designing business models that work in a digitally connected world  Growth strategy   Digital transformation   Customer experience   Innovation	9 years	Consumer & Manufacturing	3	54 min
Participant H	Principal Consultant	Financial2	Experienced in leading digital transformations with an user-centric approach as foundation to create lasting business results. He likes to work on the edge of strategy, innovation and technology	6 years	Financial	1	68 min
Participant I	Principal Consultant	Recruitment 1	Working with corporate leadership teams to capture and scale value in a technology-driven world. Supported clients across industries in developing (digital) growth strategies, accelerating innovation and delivering global transformation programs. Key areas of expertise include growth strategy, digital transformation and lean innovation.	6 years	Transport	2	50 min
Participant J	Principal consultant	Consultant1	Helping organisations to explore and exploit the benefits of digital.	21 Years	Financial	1	43 min
Participant K	Managing Consultant	Consultant1	Global Lead Platform Innovation	20+ Years	Financial	1	51 min
Participant L	Principal Consultant	Consultant1	Specialist in growth strategy, advising corporate clients on digital products and services and innovation and scaling methods and strategies. Focused on customer experience set in the context of validated business models and a business case. Collaborative approach. Platform business models champion.	15 Years	Financial	1	59 min
Participant M	Principal Consultant	Financial2	Business Integration manager designing and implementing SC planning, operations and finance processes as part of large scale ERP transformation programs for consumer and manufacturing companies	12 years	Financial	1	74 min
Participant N	Consultant	Engineering 1	Innovation Management & Strategic Design	5 years	Transport	1	27 min
Participant O	Managing Consultant	Consultant1	Business strategy formulation and - implementation, supply chain and manufacturing performance improvement, cost reduction and company restructuring	15 years	Consumer & Manufacturing	1	29 min

### 3.3.4 Data analysis

The data analysis of this thesis is aimed at understanding and identifying what dynamic capabilities are essential for digital business model innovation. Furthermore, it is aimed to identify the interventions that help to build these dynamic capabilities.

Data analysis is part of the synthesis stage of design science and it's aimed to provide insights through inductive and abductive sensemaking (Kolko, 2010). Dubois & Gadde (2002) explain that the abductive approach allows an iterative process of theory building that enables weaving back and forth between empirical data and theory. By combining scientific articles and empirical data this vast amount of information is reduced and synthesized into meaningful and actionable chunks of data. This method is particularly suitable to develop a mental model of the design space because it is less rigid due to the inductive open coding, while using an initially category system based on theoretical knowledge. This method will help to identify which dynamic capabilities are specifically useful for digital business model innovation.

The process for abductive research is presented in figure 3 and is similar to Lundin & Norrman (2010) who have based their approach on the research of Dubois & Gadde (2002) as well as Kovacs & Spens (2005). Initially the problem space is defined which led to the research proposal and research questions. Thereafter, a conceptual frame of reference is composed in chapter 2, where the initial coding categories were defined using the from theory derived critical capabilities for business model innovation in table 2. These codes initially serve as aggregated categories that help to extract sub-categories from the data. Nonetheless, it can also be possible to supplement or substitute any of the initial suggested categories.

Second, empirical data was collected by means of qualitative interviews. This empirical data is first analysed by using an open coding process, where textual data, coming from semi-structured interviews, project reports and internal knowledge documents is labelled into codes. Codes can be a word or short phrase that summarized the meaning of certain data, such as statements, sentences of paragraphs (Easterby-Smith et al., 2002). The purpose of this method is to structure messy and overwhelming data in a systematic way.

After the coding was completed a revision of the codes was done based on a systematic literature review. For this step dynamic capabilities in a digital context were derived from the systematic literature review which are used to help revise the initial frame of reference. This phase involves developing a synthesis of multiple disciplines and, as such, requires abductive reasoning in spotting the commonalities across different knowledge domains. Eventually, empirical data was analysed, findings were summarized, and a final list of dynamic capabilities was configured by building upon existing theory.

Lastly, a final framework was developed by incorporating empirical derived interventions that help to improve the earlier identified dynamic capabilities. This led to the formulation of several design propositions displayed in chapter 6.

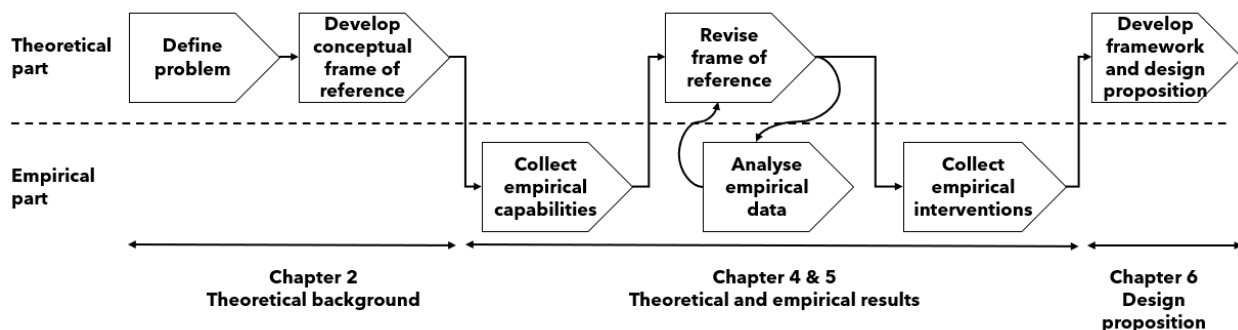


Figure 4 Abductive Research Process (based on Lundin & Norrman, 2010, p. 284)

### 3.4 DESIGN PROPOSITION

In this study, the linking mechanisms are operationalized by articulating design propositions using the CIMO logic. CIMO stands for context, intervention, mechanism and outcome and helps to guide the formulation of design propositions by evaluating which generative mechanism the intervention uses to achieve an outcome in a specific context (Denyer et al., 2008). Each element of the CIMO logic is adopted based on the research from Denyer et al. (2008), which is displayed in table 4.

Table 4 definitions of components of the CIMO logic as adapted from (Denyer et al., 2008)

<b>Component</b>	<b>Explanation</b>
Context (C)	External and internal environmental contextual factors and the nature of the persons that influence behavioural change.
Intervention (I)	The interventions managers have at their disposal to influence behaviour. These are the organizational and managerial processes, procedures, systems, and structures that undergird the building of dynamic capabilities for digital business model innovation (Teece, 2007).
Mechanisms (M)	The mechanism that is triggered by the intervention and explains the why a particular outcome is achieved in a certain context.
Outcome (O)	The outcome of the intervention in its various aspects specific to the context in which it is generated. This corresponds to the critical capabilities that are needed for digital business model innovation.

## 4 THEORETICAL RESULTS

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As shown in chapter 2.3 higher order dynamic capabilities can be divided into sensing, seizing, and reconfiguring (Teece, 2007). Subsequently, chapter 2.4 explains that these higher order concepts can be further aggregated into critical capabilities for successful business model innovation (Achtenhagen et al., 2013; Mezger, 2014; Teece, 2018a), resulting in six higher-order dynamic capabilities: (1) Business model sensing, (2) technology sensing, (3) experiment & iterate, (4) coordinate BMI, (5) integration, and (6) orchestration. Furthermore, chapter 2.5 explains how digital developments have impacted the innovation process in several ways (Nambisan et al., 2017).

Thus, to address these digital developments this paper builds on the premise that organizations need to build specific dynamic capabilities for *digital* business model innovation. This chapter provides a theoretical framework based on a systematic literature review, (as explained in chapter 3.5). This systematic literature review is aimed to provide a theoretical perspective regarding dynamic capabilities in a wider digital context. The digital contexts that have been analyzed for this review are *digital business model innovation, digital transformation, digital platform innovation, and digitalization*. Lastly, the resulted of this theoretical study are synthesized by combining several papers in the field of digital, BMI and dynamic capabilities (e.g. Helfat & Raubitschek, 2018; Nambisan et al., 2017; Soluk et al., 2021; Teece, 2018a). This results in the twelve critical capabilities displayed in table 5. An overview of this literature review and composition of each critical capability is displayed in Appendix C. Each critical capability is elaborated in the paragraphs below.

Table 5 Theoretical frame of reference dynamic capabilities for digital business model innovation

	Higher-order DC	Critical capabilities	Digital innovation challenges (based on Nambisan et al. 2017) (why)	Source
Sensing	BM Sensing	Scout digital solutions and trends	Distributed innovation agency: emerging digital competitors	<ul style="list-style-type: none"> <li>• <i>Early recognition of market dynamics</i> (Witschel et al. 2019);</li> <li>• <i>Digital scouting</i> (Warner &amp; Wäger 2019);</li> <li>• <i>Scanning</i> (Yeow et al. 2018);</li> <li>• <i>Processes to identify target market segments, changing customer needs, and customer innovation</i> (Teece, 2017);</li> <li>• <i>Marketing capabilities</i> (Soluk et al., 2021)</li> <li>• <i>Monitor the environment</i> (Steiniger et al., 2022)</li> </ul>
		Integrate customers into the ideation phase	More interaction between innovation processes and outcomes	<ul style="list-style-type: none"> <li>• <i>Needs-driven &amp; value-based digitalization</i> (Kokshagina (2021)</li> <li>• <i>Integration of customer into the ideation phase</i> (Witschel et al., 2019);</li> <li>• <i>Build direct and emotional relationship with customers</i> (Matarazzo et al., 2021);</li> </ul>
	Technology sensing	Collaborate with external partners for ideation	Distributed innovation agency	<ul style="list-style-type: none"> <li>• <i>Involvement of external partners during the ideation phase</i> (Witschel et al., 2019)</li> <li>• <i>open innovation</i> (Day &amp; Schoemaker, 2016)</li> <li>• <i>Dialog and integration with external stakeholders</i> (Inigo et al., 2017).</li> <li>• <i>Open innovation through the digital technologies</i> (Urbinati et al., 2020)</li> </ul>
		Interpreted value of external environment	Not specific for digital	<ul style="list-style-type: none"> <li>• <i>Digital scenario planning</i> (Warner &amp; Wäger, 2019);</li> <li>• <i>Modelling of value proposition and value capturing mechanisms</i> (Witschel et al., 2019);</li> <li>• <i>Combine sensing with in dept knowledge</i> (Helfat &amp; Raubitschek (2018);</li> <li>• <i>Calibrating</i> (Yeow et al., 2018);</li> <li>• <i>Knowledge exploitation capabilities</i> (Soluk et al., 2021)</li> <li>• <i>Recognize the value of external information</i> (Steininger et al., 2022);</li> </ul>
Seizing	Experiment & iterate	Rapidly develop, validate and experiment with digital business models	Less bounded innovation outcome & more interaction between innovation processes and outcomes	<ul style="list-style-type: none"> <li>• <i>Agile working</i> (Fellenstein, J., &amp; Umaganthan, A. (2019);</li> <li>• <i>Rapid prototyping</i> Warner &amp; Wäger (2019);</li> <li>• <i>Innovation capabilities</i> Helfat &amp; Raubitschek (2018);</li> <li>• <i>Appropriate organization of development competences</i> (Witschel et al., 2019);</li> </ul>
		Continuous customer integration into the development process	Less bounded innovation outcome & more interaction between innovation processes and outcomes	<ul style="list-style-type: none"> <li>• <i>Continuous customer integration into development process</i> Witschel, Döhla, Kaiser, Voigt &amp; Pfletschinger (2019).</li> <li>• <i>External partnerships</i> (Fellenstein, J., &amp; Umaganthan, A. (2019);</li> <li>• <i>Kreutzer et al. (2017)</i></li> </ul>
	Coordinate BMI	Strategic agility and innovation alignment	Less bounded innovation outcome & more interaction between innovation processes and outcomes	<ul style="list-style-type: none"> <li>• <i>digital strategy development</i> (Ellström, Holtstrom, &amp; Johansson (2021);</li> <li>• <i>Strategic agility</i> (Warner &amp; Wäger (2019);</li> <li>• <i>Strategic orientation towards digitalization</i> (Arias-Pérez, José;Velez-Ocampo, Juan;Cepeda-Cardona, Juan (2021);</li> <li>• <i>Sebastian et al. (2017);</i></li> <li>• <i>Strategy guides business model design</i> Teece (2018b)</li> </ul>
		Balance digital portfolios & strategic investments	Not specific for digital	<ul style="list-style-type: none"> <li>• <i>Balancing digital portfolios</i> (Warner &amp; Wäger (2019);</li> <li>• <i>Digital asset investment</i> (Fellenstein, J., &amp; Umaganthan, A. (2019);</li> <li>• <i>Determine enterprise boundaries</i> (Ellström, Holtstrom, &amp; Johansson (2021);</li> </ul>

Reconfiguring	Integration	Enhance internal knowledge exchange and integration	Distributed innovation agency & emergence of digital platforms	<ul style="list-style-type: none"> <li>• <i>Enhance know how exchange and internal communication</i> (Witschel et al., 2019);</li> <li>• <i>Knowledge management</i> (Teece 2007)</li> </ul>
		Scale business model through partnerships and digital ecosystems	Distributed innovation agency & emergence of digital platforms	<ul style="list-style-type: none"> <li>• <i>Integration capability</i> (Helfat &amp; Raubitschek (2018)</li> <li>• <i>Navigating innovation ecosystem</i> Warner &amp; Wäger (2019);</li> <li>• <i>Digital intensity</i> (Sousa-Zomer, Neely, Martinez (2020);</li> <li>• <i>business ecosystems have become increasingly important</i> (Teece (2018b);</li> </ul>
	Orchestration	Redesign and reconfigure organizational structure	Less bounded innovation outcome & distributed innovation agency	<ul style="list-style-type: none"> <li>• <i>Organizational restructuring</i> (Fellenstein, J., &amp; Umaganthan, A. (2019);</li> <li>• <i>Future oriented organizational design and transformation</i> (Witschel et al, 2019);</li> <li>• <i>Decentralization and near decomposability</i> Teece (2007);</li> <li>• <i>Redesigning internal structures</i> (Warner &amp; Wäger (2019);</li> <li>• <i>Context for action and interaction</i> (Sousa-Zomer, Neely, Martinez (2020)</li> </ul>
		Provision and develop digital competences	Not specific for digital	<ul style="list-style-type: none"> <li>• <i>Improving digital maturity</i> (Warner &amp; Wäger (2019);</li> <li>• <i>Digital savvy skills</i> (Sousa-Zomer, Neely, Martinez (2020);</li> <li>• <i>Sustainable provision and development of key competencies</i> (Witschel, et al., 2019);</li> <li>• <i>Change management</i> (Fellenstein, J., &amp; Umaganthan, A. (2019)</li> </ul>

## **4.1 DIGITAL BUSINESS MODELS SENSING**

Given the unbounded nature of digital innovation, it is argued that firms should engage in continuous sensing, to provide organizations with insights into (new) markets, (new) technologies, (re)positioning the firms, and dealing with customers or changing customer needs (Helfat & Winter, 2011). Firms need to be aware of their business ecosystem, this comprises not only their immediate environment and direct competitors, but also threats of new entrants and technological trends (Ellström et al., 2021; Warner & Wäger, 2019; Witschel et al., 2019). For digital BMI, due to its receding boundaries, decentralized and distribute nature (Yoo et al., 2010), firms innovation processes should focus on dynamic problem-solution design pairing (Nambisan et al., 2017). Which highlights that digital innovation involves the continuous matching of the potential (or capabilities) of new and/or newly recombined digital technologies with original market offerings.

Furthermore, literature highlights that such sensing capabilities have become increasingly digitized (Nambisan et al., 2017; Sebastian et al., 2017). Incumbent firms are increasingly using disruptive technologies, such as artificial intelligence, analytics and IoT platforms to make sense of big data (Warner & Wäger, 2019). Furthermore, in a digital era of information abundance (Bharadwaj et al., 2013), incumbent firms are compelled to develop capabilities in digital scouting and digital scenario planning to make sense of unexpected trends in a fast-changing digital environment (Matt et al., 2015; Warner & Wäger, 2019). This pressures organizations in developing these capabilities. Early awareness of market dynamics and trends is needed, especially in volatile environments, otherwise important opportunities for adapting or innovation your business model will not be recognized (Witschel et al., 2019).

### **4.1.1 Scan and monitor the external environment**

Early awareness of market dynamics and trends is needed, especially in volatile environments, otherwise important opportunities for adapting or innovating the business model will not be recognized. Due to the rapid speed of digital change and the short innovation cycle, it is important to identify relevant market trends ahead of competitors and fill the white spots as quickly as possible. In this context, organizations need to intensively scan the market environment and recognize business opportunities at the right time. Anyanwu (2016) states that identifying opportunities requires not only understanding the latent needs of potential clients, but also the development of industries, markets and competition. Therefore, from a sensing perspective, it is important to explore the market, recognize the technical potential and obtain relevant information about the competitors (Achtenhagen et al., 2013; Pavlou & El Sawy, 2011; Teece, 2014).

### **4.1.2 Integrate customers into the ideation phase**

A central aspect in the search for new business models is a deep understanding of customer requirements (Teece, 2018a). Scholars have addressed that customer contact is an essential part of sensing (Feiler and Teece 2014; Teece 2007). This includes, for example, the ability to identify and understand customer needs, recognize changing preferences and interpret fluctuations in demand (Anyanwu, 2016). Continuously incorporating customer feedback can help to develop customer-centric business models that meet customer needs (Teece, 2010; Mezger, 2014).

When pursuing digital BMI however, it is less clear whether a specific business model is finite. Therefore, it is argued that these fluid boundaries lead to an increasing need of continuous sensing and integrating customer to better anticipate the success of digital business model innovation. Especially in times of digital change such dynamic capabilities are useful as they help firms to establish novel customer-centric business models (Abrell et al., 2016).

This is important for digital solutions, since experimenting interactively with customers is an important feature for identifying their latent needs (Day & Schoemaker, 2016; Sawy & Pereira, 2013). Furthermore, in the digital context, customer integration is a priority, as new and existing customer needs need to be understood and met. Therefore, integration of customer in an early state is critical for the success of digital business models (Witschel et al., 2019).

## **4.2 DIGITAL TECHNOLOGY SENSING**

Digital business model innovation largely revolves around emerging digital technologies. Therefore, an important capability is formed by a firm's ability to acquire emerging technological know-how and transform this knowledge into novel business opportunities. Technological sensing has especially been associated with the development of more radical new business models (Mezger, 2014).

### **4.2.1 Ability to collaborate with external partners for ideation**

In the context of digitalization, concepts like 'open innovation' and 'innovation ecosystems' have become increasingly important when developing business opportunities (Day & Schoemaker, 2016; Kreutzer et al., 2017; Westerman et al., 2014). A firm's ability to connect with multiple and institutionalized external technology resources, regardless of their initial knowledge base, is of significant importance to identify opportunities for new business models (Mezger, 2014). Also, active dialog with external stakeholders and proper integration of them is an important function for sensing (Inigo et al., 2017). External stakeholders can be suppliers, customers, universities, industry partners, start-ups and more. Especially in a digital era, solely rely on internal resources and own knowledge only is not sufficient to explore promising business models under high time pressure. Therefore, early involvement (in the ideation phase) has been identified as crucial when aiming to develop digital business models (Witschel et al., 2019). For the adoption of digital technologies, organizations have to reorganize their development processes and activities for open innovation through the use of digital technologies (Urbinati et al., 2020). To be able to integrate external knowledge, firms need to standardize technical features, formalize budgets for digital investments, and develop new and formalized procedures for innovation activities. Furthermore, these open innovation initiatives provide firms with access to new markets and possibilities to mitigate risk of highly uncertain digital technologies (Tripsas, 1997). Cooperation can take several forms with different partners which encompasses start-ups, strategic alliances, industry networks, universities or even competitors.

### **4.2.2 Ability to recognize and interpreted value of external environment**

Another critical capability regarding technology sensing is a firm's ability to recognize and interpreted value of the external environment. To actually benefit from technological innovation organizations need to possess the ability to transform technological opportunities



into viable business models (Mezger, 2014). Ellström et al. (2021) emphasize that firms need sensing capabilities that help to evaluate the demand for digital infrastructure and then search for new solutions. Thus, organizations need to be able combine scanning in sensing capabilities with in-depth knowledge of their core products as well as knowledge of the products of complementary asset providers (Helfat & Raubitschek, 2018). As information is widely available in a digital age, Wagner and Warner (2019) emphasize a firm's ability to make sense of available opportunities by building digital scenario planning capabilities. This comprises activities that help to analyse scouted signals, interpreted digital scenarios and define digital growth areas. Similar, with the advances in digitalization, business models have become inherently customer-centred, and it is imperative that companies are able to design value propositions and revenue models accordingly (Witschel et al., 2019). Otherwise, it will be nearly impossible to generate sustainable revenue from new businesses (Teece, 2010, 2018a).

### **4.3 DEVELOP DIGITAL BUSINESS MODELS**

For the actual realization of business models, organizations have to transfer technological and business model trends into viable and valuable business model configurations. Proper conceptualization of value propositions and revenue models requires a complete understanding of customer issues and the ability to address and translate them into value propositions and overall business model design. Especially during the pre-paradigmatic industry evolution phase, it is necessary to stay flexible, experiment with the product and business model, and learn from own and competitors' activities (Teece, 1986).

#### **4.3.1 Rapidly develop, validate and experiment with new business models**

In a digital world, there is a paradigm shift where innovation is no longer a linear process but one where the user is feeding back to the producer what innovation is needed (Bogers et al., 2018). Characteristics of digital technologies enable product ideas to be quickly formed, changed and reprogrammed through repeated innovation cycles (Nambisan et al., 2017). As a result, dependencies between innovation processes and outcomes are more complex and dynamic. Therefore, a dynamic and iterative innovation process is required that constantly matches the changing environment. In the context of digital platforms, Helfat & Raubitschek (2018) emphasize the importance of an organizational innovation capability. Innovation capabilities allow an organization to continuously transform knowledge and ideas into new products, processes, and systems through product sequencing (Helfat & Raubitschek, 2018). Important here is the emphasize on product sequencing and the continuous innovation process.

In the context of digital transformation, several scholars address agile working as increasingly important (Fellenstein & Umaganthan, 2019; Warner & Wäger, 2019; Witschel et al., 2019). Agile methods are particularly used to increase the speed and agility of business model development by incrementally improve products in short iterative cycles. Furthermore, it is aimed to evoke a new culture with a focus on customer-centric behaviour with continuous change and sharing (Abolhassan, 2017; Sebastian et al., 2017; Teece et al., 2016). As a result, enterprises can respond flexibly and quickly to changing customer needs, minimalizing errors or reduce documentation costs. Key elements of this methodology are daily communication

and sprint reviews to increase transparency and team performance. In addition, end-to-end processes and cross-functional teams can serve as supportive activities.

Another well-known approach is the *lean start-up methodology*, which is used for rapid and flexible testing and adjusting business models by obtaining customer feedback (Ries 2011; Schallmo et al. 2017). This method aims to shorten development cycles in an entrepreneurial manner, by adopting a combination of experimentation, validated learning and iterative principles. In the field of digital entrepreneurship, this method has already been used successfully as tool for business model innovation (Ghezzi, 2020; Ghezzi & Cavallo, 2020). Also from a capability perspective, agile and iterative approaches have been emphasized as important activities for seizing (Mezger, 2014). More specifically, it underpins the iterative conjunction between sensing and seizing, which lead to learning-oriented development processes (Teece, 2010). Other key methods that are addressed help to enhance this capability are innovation sprints, rapid prototyping, digital innovation labs and minimal viable products.

#### 4.3.2 Continuous customer integration into the development process

With the advances in digitalization, business models have become inherently customer-centred, and it is imperative that companies are able to design value propositions and revenue models accordingly (Witschel et al., 2019). Otherwise, it will be nearly impossible to generate sustainable revenue from new businesses (Teece, 2010, 2018a). This involves business models that dynamically transcend organizational boundaries within the innovation ecosystem, which requires a firm's ability to create an ecosystem where people, organizations and sectors can foster co-creation (Adner & Kapoor, 2010).

To ensure that new digital solutions are optimized for the needs of customers, activities such as *continuous testing of products and services with end users* and the *direct feedback mechanism* prove to be essential for successful business model innovation (Amit and Han 2017; Kreutzer et al. 2017). This inquires flexible customer request and suggestions for improvements before the solution is fully developed. Testing with customers is primarily conducted to provide direct feedback on the business model. In line with the lean start-up methodology, solutions are initially offered as MVP, such that elements of the businesses model are iteratively improved and expanded based on customer feedback. The main goal is to identify problems early and develop a business model that fully meets the needs of the customer. Herby the main focus is the collaborative learning process with customers (Kreutzer et al., 2017; Ries, 2011; Teece et al., 2016). Other useful tools that could be used are sprint reviews and workshops or surveys with a heterogenous group of lead users.

## 4.4 COORDINATE DIGITAL BUSINESS MODEL INNOVATION FOR SEIZING

In the digital age, it is of paramount importance for innovators to coordinate complementary assets, design good business models, and align strategy and capabilities (Teece, 2018b). Strategizing has been indicated to play a crucial role for business model innovation (Achtenhagen et al., 2013; Casadesus-Masanell & Ricart, 2010). As each element of the business model needs to be aligned, the same is true for the alignment between an organization's strategy and its business model (Rumelt, 2012).

Teece (2018a) argues that the arrival of new technology (e.g., the internet) has opened opportunities for radical new business model to which corporate strategy must respond. However, as Teece continues, it might be more accurate to state that “dynamic capabilities and strategy combine to create and refine a defensible business model, which guides organizational transformation” (Teece, 2018a, p. 42). Thus, strategic analysis is an essential step when designing a competitive business model. Therefore, coordination and strategic alignment has been argued to form a critical dynamic capability for digital business model innovation.

#### 4.4.1 Strategic agility and innovation alignment

Next to shorten development time this agile methodology allows to improve strategic agility and fast-decision making, which is central to seizing technological opportunities (Sebastian et al., 2017; Teece et al., 2016; Warner & Wäger, 2019). Therefore, strategic agility is the driving force for ongoing business model innovation (Sebastian et al., 2017; Teece et al., 2016; Warner & Wäger, 2019). As Ellström et al. (2021, p. 9) describe “in a changing environment and with flexible business objectives, firms undergoing digital transformation need to semi-continuously adapt their digital strategy.” So, in order to digitalize the business model, the digital strategy also needs to develop. This has been confirmed by Arias-Pérez et al. (2021) who show that a strategic orientation towards digitalization has a positive impact on a firm's innovation capability, particularly on its technology-focused and client focused innovation capabilities.

#### 4.4.2 Ability to balance digital portfolios & manage strategic investments

Evident in several papers regarding digital business model innovation, is a firm's ability to balance its digital portfolio and resources. Balancing digital portfolio has been addressed by Warner & Wäger (2019) as the ability to scale business model innovations that have the potential to enhance existing customer needs and demands. Furthermore, Fellenstein (2019) describe that developing digital solutions often requires large and sometimes irreversible strategic investment in tangible and intangible assets. Therefore, it is using resources and capabilities in a balanced way is seen as critical capability for digital business model innovation (Achtenhagen et al., 2013). Prioritizing which digital opportunities to turn into projects as assessing ongoing projects requires routines that help to evaluate how initiatives fit the digital strategy and contribute to digital business models (Ellström et al., 2021). Furthermore, as Teece (2007) addresses, when operating in regimes or rapid technological innovation, making astute investment decisions requires specialised skills that enable managers to review entire innovation spaces and take into account cospecializations and irreversibilities. Developing a portfolio and clear decision criteria would help to develop an overview to effectively allocate resources (Ellström et al., 2021). Karimi and Walter (2015) propose a step-by-step resource allocation approach based on the ongoing evaluation of projects. Additionally, Teece (2007) describe the selection of enterprise boundaries as a critical capability for seizing opportunities. Therefore, in digital transformation Ellström (2021) address that organizations needs to possess routines to determine what to do in-house and what to outsource.

### 4.5 INTEGRATION CAPABILITIES DIGITAL BUSINESS MODEL INNOVATION

The fluid boundaries of digital innovations, the decentralized innovation agencies and the continuous dynamics of digital innovation all indicate the necessity of organizations to be able

to integrate and exploit internal and external knowledge. This integrative capacity enables firms to align activities, products, resources (including knowledge) and capabilities, investments and objective with their partners, in addition to facilitating internal coordination within firms (Helfat & Campo-Rembado, 2016). Helfat and Campo-Rembado (2016) suggest that firms could benefit from integrative capabilities to support interaction and relationships with external partners. External partnerships offer firms the opportunity to benefit from networking and learning effects (Kreutzer et al., 2017; Westerman et al., 2014). Especially in context of digital, changes in business models focusses on creating common value in the sense of co-creation, which in particular requires relational abilities of an organization (Day & Schoemaker, 2016; Sawy & Pereira, 2013). Furthermore, integrative capabilities are also essential for knowledge management. In order to profit from acquired knowledge, it is necessary to develop learning processes such as "inter-company knowledge sharing routine" and "absorption ability" (Helfat et al., 2007). For digital business model innovation, organizations knowledge exploitation capabilities are essential to deal with uncertainty in dynamic environments (Foss & Saebi, 2017; Soluk et al., 2021). Where knowledge exploitation enables firms to access and recombine knowledge, manage learning mechanism and leverage new knowledge for the creation of business value (Easterby-Smith et al., 2002).

In the context of digital transformation external collaboration has become increasingly important for identifying new business opportunities (Bonnet & Westerman, 2021; Witschel et al., 2019). Actively collaborating with external stakeholders and integrate them in an appropriate way has been addressed as important capability for digital business model innovation (Witschel et al., 2019). Especially in a digital era, solely rely on internal resources and own knowledge only is not sufficient to explore promising business models under high time pressure. Therefore, early involvement (in the ideation phase) has been identified as crucial when aiming to develop digital business models (Witschel et al., 2019). Also, in the context of digital platforms, integrative capability plays a key role in improving a firms ability capture value by building and design digital business models (Helfat & Raubitschek, 2018). Furthermore, in a digital context 'open innovation' approach has become increasingly important for identifying new business opportunities (Bogers et al., 2018).

Collaboration with external partners can see several forms such as start-ups involvement, strategic alliances, co-operation. To enhance this capability, organizations undertake several activities such as accelerators, incubators, start-up programs and venture capital units (Witschel et al., 2019).

#### **4.5.1 Ability to scaling the business model through partnerships and digital ecosystems**

In addition to collaboration with partners for ideation, partnerships can also help to scale business models and enable the development of appropriate capabilities. For most innovation, relevant capabilities are often already available externally. Outsourcing can help to shorten the path to successful commercialization. Start-ups will almost certainly have to rely on partners, but even most incumbents will lack relevant capabilities to unlock full potential from emerging business models (Teece, 2018b).

Furthermore, as innovation is more distributed in a digital world, business ecosystems have become increasingly more important when aiming to profit from innovation (Teece, 2018b).

Especially regarding digital platform businesses, a firm's ability to integrate and manage the innovation ecosystem has been addressed as critical for capturing value (Helfat & Raubitschek, 2018; Teece, 2018b). Hereby a firm's value-based strategy plays a key role, in which firms seek to structure relationships with their complementors and suppliers to create and capture maximum value.

#### 4.5.2 Ability to enhance internal knowledge exchange and integration

Especially in times of rapid change, internal integration along the value chain and across organizational units plays a crucial role and requires adequate transforming skills to create transparency and involvement among employees (Kreutzer et al., 2017). The organization of the development team is an important feature when implementing business models. For the development to digital business models, organizations are increasingly adopting cross divisional organizational structures (Kreutzer & Land, 2015). Especially in a digital context, as interdisciplinary knowledge needs to be bundled together (Mezger, 2014; Schallmo et al., 2017). Because commercialising new business models; it requires coordination, collaboration, and knowledge integration across multiple parties (e.g., customers, suppliers, retailers, distributors) and multiple business functions (e.g., marketing and sales, finance and accounting, manufacturing, R&D, and supply chain) for successful implementation of new solutions (Joshi et al., 2010; Witschel et al., 2019). Therefore literature shows the role of IT-enabled knowledge capabilities for continuous innovation (Joshi et al., 2010; Kleis et al., 2012). As Karimi & Walter (2015) show that first order dynamic capabilities are needed to build digital infrastructures that help deliver digital products and services.

Furthermore, as innovation is more scattered across the organization and information is widely available, organizations need to bundle information and work in a more end-to-end manner (Kreutzer & Land, 2015). Digital solutions and initiatives can be used create enterprise-wide synergies that help to overcome internal barriers and support exchange (Kleinbaum & Stuart, 2014). These solutions can range from online training platforms, internal knowledge sharing and digital support initiatives which helps to recombine internal knowledge to develop and nurture absorptive capacity (Urbinati et al., 2020). To remove resistance and scepticism toward development activities, organizations should promote successes by hosting internal events or digital conference. This open communication helps to create cross-divisional transparency and strengthens the commitment and motivation of employees (Achtenhagen et al., 2013; Teece, 2007).

## 4.6 ORCHESTRATION CAPABILITIES FOR RECONFIGURING

Addressed by several scholars as crucial capability for business model innovation is a firm's ability to orchestrate its innovation activities (Nambisan et al., 2017; Teece, 2007, 2018a; Witschel et al., 2019). Orchestration refers to the responsibility of one or more entities or firms who are responsible for sourcing, evaluating and selecting new structures, processes, resources, competences and assets. They also embrace the enterprise's capacity to shape the ecosystem it occupies, develop new products and processes, and design and implement viable business models (Teece, 2007). As stated by Teece (2018b, p. 16) *"In a digital economy, it is of paramount importance that innovators orchestrate complementary assets, design good business models, and match strategy and capabilities"*.

Digital business models design, its value creation and capture mechanisms are far more complex in a digital age than the simplified 'licensing versus in-house production' addressed by Teece in 1986 (Teece, 2018b). For digital innovation there is an increasing need for orchestration as innovation boundaries get more diffused and innovation agency are more distributed (Nambisan et al., 2017). Therefore, a firm's resources must be orchestrated astutely and coordinated with the activities of partner firms, to deliver value to customers. Furthermore, reconfiguring business models almost always requires substantial investment in the development and commercialization of new products, processes, or services (Teece, 2007). For digital BMI companies invest actively in new digital assets such as digital products and services, digital technologies, digital customer interactions, digital tools, and digital processes (Fellenstein & Umaganthan, 2019). This can require large and sometimes irreversible strategic investments in tangible and intangible assets (Helfat & Peteraf, 2015) which is often associated with senior management commitments, substantial funds, as well as organizational coordination under complexity and uncertainty.

#### **4.6.1 Ability to redesign and reconfigure organizational structure**

Digital business model innovation requires firms to significantly reconfigure their value chain, organizational structure and organizational design (Mezger, 2014; Teece, 2007; Warner & Wäger, 2019; Witschel et al., 2019). Therefore, firms need to rethink their activity system and the way they create and deliver value (Zott & Amit, 2010). In order to successfully redesign an organization's structure for digital business models several things have to be taken into account. Operational changes include restructuring of existing departments, formulating new digital roles, allocating digital responsibilities and promoting a digital culture. Furthermore, in order to build the capabilities for redesigning internal structures Warner & Wäger (2019) argue, that firms need to build a leadership team, strategy and business models that adopt a digital focus. To build and sustain dynamic capabilities, decentralisation must be favoured (Teece, 2007). Several scholars have addressed that functional and departmental silos form a large barrier to a company's success in the digital age (Bender & Willmott, 2018; Sousa-Zomer et al., 2020). In contrast, multi-divisional organizations have been found to be more efficient innovators because of their decentralized product development and decision making (Tidd, 2001). Therefore, for digital business model development organizations need to work in decentralized units and establish independent subsidiaries (Warner & Wäger, 2019). Additionally, research has indicated that an organizational structure where agile and entrepreneurial mindset is cultivated is necessary to keep reconfiguring the business in a fast-paced digital environment (Day & Schoemaker, 2016; Sousa-Zomer et al., 2020). As Sousa-Zomer et al. (2020) suggest "Improving digital maturity and performing digital transformation requires an agile structure and also a digital culture that bolsters risk-taking, agility and collaboration." Moreover, agile practices need to be supported by an appropriate risk-taking culture, which has proven to enhance and sustain innovation (Karimi & Walter, 2015).

#### **4.6.2 Ability to provision and reconfigure key competences**

Lastly, firms need to be able to actually source and reconfigure operational competences and resources necessary to implement the digital business model. Digital business model requires several new skills from employees regarding the use and application of digital technologies. As Warner & Wäger (2019) address, for digital transformation a fundamental capability is to

improve the digital maturity of an externally recruited and internally promoted workforce. Additionally, Sousa-Zomer et al. (2020) confirm that organizations need to have the right digital-savvy skills that allow them to constantly execute digital initiatives and reconfigure their resource base to maintain relevant in a fast-paced digital landscape.

To do so, it is important to investigate which competences are required and assess the current competences of the organization. This digital maturity assessment provides guidelines to help organization in reconfiguring their competences (Warner & Wäger, 2019; Westerman et al., 2014). Next, organizations need to carefully decide between internal and external modes of capability sourcing (Capron & Mitchell, 2009). For the internal development of digital competences routines can be established such as internal training sessions, educations programs, workshops or e-learning courses (Witschel et al., 2019). Besides internal modes of competence development organizations can acquire external competences by recruiting, hiring external consultants, or even partnering. Especially the recruitment of entrepreneurial and digital-savvy talent has been addressed as key when digital transforming (Sousa-Zomer et al., 2020; Warner & Wäger, 2019; Witschel et al., 2019).

## 5 EMPIRICAL RESULTS

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In this section, the empirical analysis will be described. For this empirical part a multiple case study was conducted into a consultancy firm and four incumbent organizations. A description of each case is provided in chapter 3.4.3. This empirical part helps to validate, clarify and extends upon the previously acquired theoretical dynamic capabilities

Several steps were taken to establish the results of this study. Initially empirical data was collected by semi structured interviews, project reports and internal knowledge documents. The objective of these interviews is to understand what processes organizations undertake for sensing, seizing, reconfiguring with respect to their digital business model innovation process. These empirical results are linked with the initial frame of reference that display higher-order dynamic capabilities. Thereafter through an iterative process dynamic capabilities from empirical data were linked to earlier identified theoretical findings. After the dynamic capabilities have been established, a second round of interviews is conducted that is aimed to identify what interventions are used in each case company that help to build the earlier identified dynamic capabilities. An overview of the interventions that were used by each case company is displayed in Appendix D. The final results of this empirical analysis are displayed in table 6.



Table 6 Final framework dynamic capabilities for digital business model innovation

		Critical capability	Theoretical support	Interventions – Empirical	Digital innovation challenges (based on Nambisan et al. 2017)
Sensing	BM Sensing	Scout for digital solutions and trends	<ul style="list-style-type: none"> <li>• <i>Early recognition of market dynamics</i> (Witschel et al. 2019);</li> <li>• <i>Digital scouting</i> (Warner &amp; Wäger 2019);</li> <li>• <i>Scanning</i> (Yeow et al. 2018);</li> <li>• <i>Processes to identify target market segments, changing customer needs, and customer innovation</i> (Teece, 2017);</li> <li>• <i>Marketing capabilities</i> (Soluk et al., 2021)</li> <li>• <i>Monitor the environment</i> (Steiniger et al., 2022)</li> </ul>	<ul style="list-style-type: none"> <li>• Create dedicated scouting structure</li> <li>• Screen for digital competitors</li> <li>• Perform industry benchmarking</li> </ul>	Distributed innovation agency: emerging digital competitors
		Integrate customers into the ideation phase	<ul style="list-style-type: none"> <li>• <i>Needs-driven &amp; value-based digitalization</i> (Kokshagina (2021)</li> <li>• <i>Integration of customer into the ideation phase</i> (Witschel et al., 2019);</li> <li>• <i>Build direct and emotional relationship with customers</i> (Matarazzo et al., 2021);</li> </ul>	<ul style="list-style-type: none"> <li>• Interact with customers through digital solutions</li> <li>• Validate customer needs through digital communities</li> <li>• Gather customer insights through data analytics</li> </ul>	More interaction between innovation processes and outcomes
	Technology sensing	Collaborate with external partners for ideation	<ul style="list-style-type: none"> <li>• <i>Involvement of external partners during the ideation phase</i> (Witschel et al., 2019)</li> <li>• <i>open innovation</i> (Day &amp; Schoemaker, 2016)</li> <li>• <i>Dialog and integration with external stakeholders</i> (Inigo et al., 2017).</li> <li>• <i>Open innovation through the digital technologies</i> (Urbinati et al., 2020)</li> </ul>	<ul style="list-style-type: none"> <li>• Establish start-up scouting team</li> <li>• Establish start-up accelerator</li> <li>• Set up corporate investment fund</li> </ul>	Distributed innovation agency
		Interpreted value of external environment	<ul style="list-style-type: none"> <li>• <i>Digital scenario planning</i> (Warner &amp; Wäger, 2019);</li> <li>• <i>Modelling of value proposition and value capturing mechanisms</i> (Witschel et al., 2019);</li> <li>• <i>Combine sensing with in dept knowledge</i> (Helfat &amp; Raubitschek (2018);</li> <li>• <i>Calibrating</i> (Yeow et al., 2018);</li> <li>• <i>Knowledge exploitation capabilities</i> (Soluk et al., 2021)</li> <li>• <i>Recognize the value of external information</i> (Steiniger et al., 2022);</li> </ul>	<ul style="list-style-type: none"> <li>• Conceptualize the business model prototype</li> <li>• Search for technological trends</li> </ul>	Not specific for digital
Seizing	Develop & design	Rapidly develop, validate, and experiment with digital business models	<ul style="list-style-type: none"> <li>• <i>Agile working</i> (Fellenstein, J., &amp; Umaganthan, A. (2019);</li> <li>• <i>Rapid prototyping</i> Warner &amp; Wäger (2019);</li> <li>• <i>Innovation capabilities</i> Helfat &amp; Raubitschek (2018);</li> <li>• <i>Appropriate organization of development competences</i> (Witschel et al., 2019);</li> </ul>	<ul style="list-style-type: none"> <li>• Embed agile way of working</li> <li>• Implement the lean start-up methodology</li> <li>• Implement prototype platform</li> <li>• Establish digital center of excellence</li> </ul>	Less bounded innovation outcome & more interaction between innovation processes and outcomes
		Continuous customer integration into the development process	<ul style="list-style-type: none"> <li>• <i>Continuous customer integration into development process</i> Witschel, Döhla, Kaiser, Voigt &amp; Pflutschinger (2019).</li> <li>• <i>External partnerships</i> (Fellenstein, J., &amp; Umaganthan, A. (2019);</li> <li>• Kreutzer et al. (2017)</li> </ul>	<ul style="list-style-type: none"> <li>• Engage in design thinking</li> </ul>	Less bounded innovation outcome & more interaction between innovation processes and outcomes

Reconfiguring	Coordinate BMI	Strategic align digital business model innovation	<ul style="list-style-type: none"> <li>• <i>digital strategy development</i> (Ellström, Holtstrom, &amp; Johansson (2021);</li> <li>• <i>Strategic agility</i> (Warner &amp; Wäger (2019);</li> <li>• <i>Strategic orientation towards digitalization</i> (Arias-Pérez, José;Velez-Ocampo, Juan;Cepeda-Cardona, Juan (2021);</li> <li>• Sebastian et al. (2017);</li> <li>• <i>Strategy guides business model design</i> Teece (2018b)</li> </ul>	<ul style="list-style-type: none"> <li>• Align innovation with digital strategy</li> <li>• Define digital growth areas</li> <li>• Define digital milestones &amp; objectives</li> </ul>	Less bounded innovation outcome & more interaction between innovation processes and outcomes
		Balance digital portfolios & manage strategic investments	<ul style="list-style-type: none"> <li>• <i>Balancing digital portfolios</i> (Warner &amp; Wäger (2019);</li> <li>• <i>Digital asset investment</i> (Fellenstein, J., &amp; Umaganthan, A. (2019);</li> <li>• <i>Determine enterprise boundaries</i> (Ellström, Holtstrom, &amp; Johansson (2021);</li> </ul>	<ul style="list-style-type: none"> <li>• Define digital funnel blueprint</li> <li>• Establish central innovation board</li> <li>• Define digital innovation metrics</li> </ul>	Less bounded innovation outcome & distributed innovation agency
	Integration	Enhance internal knowledge exchange and integration	<ul style="list-style-type: none"> <li>• <i>Enhance know how exchange and internal communication</i> (Witschel et al., 2019);</li> <li>• <i>Knowledge management</i> (Teece 2007)</li> </ul>	<ul style="list-style-type: none"> <li>• Develop integrated technology platform</li> </ul>	Distributed innovation agency & emergence of digital platforms
		Scale business model through partnerships and digital ecosystems	<ul style="list-style-type: none"> <li>• <i>Integration capability</i> (Helfat &amp; Raubitschek (2018)</li> <li>• <i>Navigating innovation ecosystem</i> Warner &amp; Wäger (2019);</li> <li>• <i>Digital intensity</i> (Sousa-Zomer, Neely, Martinez (2020);</li> <li>• <i>business ecosystems have become increasingly important</i> (Teece (2018b);</li> </ul>	<ul style="list-style-type: none"> <li>• Introduce an accelerator for start-ups</li> <li>• Establish a digital platform business</li> </ul>	Distributed innovation agency & emergence of digital platforms
	Orchestration	Redesign and reconfigure organizational structure	<ul style="list-style-type: none"> <li>• <i>Organizational restructuring</i> (Fellenstein, J., &amp; Umaganthan, A. (2019);</li> <li>• <i>Future oriented organizational design and transformation</i> (Witschel et al, 2019);</li> <li>• Decentralization and near decomposability Teece (2007);</li> <li>• <i>Redesigning internal structures</i> (Warner &amp; Wäger (2019);</li> <li>• <i>Context for action and interaction</i> (Sousa-Zomer, Neely, Martinez (2020)</li> </ul>	<ul style="list-style-type: none"> <li>• Incorporate outside-in organizational restructuring</li> <li>• Map operations with business activity model</li> </ul>	Distributed innovation agency & less bounded innovation outcome
		Provision and develop digital competences	<ul style="list-style-type: none"> <li>• <i>Improving digital maturity</i> (Warner &amp; Wäger (2019);</li> <li>• <i>Digital savvy skills</i> (Sousa-Zomer, Neely, Martinez (2020);</li> <li>• <i>Sustainable provision and development of key competencies</i> (Witschel, et al., 2019);</li> <li>• <i>Change management</i> (Fellenstein, J., &amp; Umaganthan, A. (2019)</li> </ul>	<ul style="list-style-type: none"> <li>• Establish transformation office</li> <li>• Intelligence hub</li> <li>• Coach and collaborate</li> <li>• Interactive training programs</li> </ul>	Not specific for digital

## 5.1 INTERVENTIONS FOR BUSINESS MODEL SENSING

Several interventions were identified that help to build the critical capabilities for digital business model sensing.

### 5.1.1 Scan and monitor the external environment

The ability to *scout for digital solutions and trends* is derived from an empirical and theoretical analysis. The results of this analysis are summarized in table 7 and each element is elaborated in the text below.

Table 7 Capability & interventions: scout digital solutions and trends

Critical capability	Theoretical support	Interventions	Digital innovation challenges (based on Nambisan et al. 2017)
Scan and monitor the external environment	<ul style="list-style-type: none"> <li>• <i>Early recognition of market dynamics</i> (Witschel et al. 2019);</li> <li>• <i>Digital scouting</i> (Warner &amp; Wäger 2019);</li> <li>• <i>Scanning</i> (Yeow et al. 2018);</li> <li>• <i>Processes to identify target market segments, changing customer needs, and customer innovation</i> (Teece, 2017);</li> <li>• <i>Marketing capabilities</i> (Soluk et al., 2021)</li> <li>• <i>Monitor the environment</i> (Steiniger et al., 2022)</li> </ul>	<ul style="list-style-type: none"> <li>• Create dedicated scouting structure</li> <li>• Screen for digital competitors</li> <li>• Perform industry benchmarking</li> </ul>	Distributed innovation agency: emerging digital competitors

#### **Create dedicated scouting structure**

Mentioned by participants is the need for a dedicated organizational structure that allows organizations or individuals to sense for digital opportunities. Many organizations are primarily oriented at their daily operations, where innovation is on-top of their existing work. However, to innovate effectively it is important to create an environment and governance structure that allows you to sense for new opportunities. Therefore, another approach is to create a separate unit or capability that has the expertise and processes to analyses trends and come with ideas and opportunities. As Participant K points out: *“That actually requires a separate structure. And then you have a machine that is constantly scouting, renewing, exploring, converting the innovative into propositions.”*. This separate structure can also be recognized within Recruiting1, where a separate team of analysts, strategists or innovators have the responsibility to monitor the external environment. They’re responsible for analysing trends, watching competitors, and reviewing start-ups etc. ’

#### **Screen for digital competitors**

As addressed by almost all participants it the ability to understanding your competitive landscape and knowing what competitors are offering. With the rise of new digital offering, the competitor’s landscape is changing. For example, Engineering1 has seen its competitor landscape change: *“In the past our competitors were formed by other engineering parties, but now the Googles and the Autocads of the world are threatening our existence by offering software. Suddenly this software with accompanied IP rights is growing in value, which forces us to change. Digital parties often have access to valuable data, while Engineering1 is not organized in that way. Therefore, we need to consider the value of this data and reconsider our value propositions.”* Therefore, organizations need to be aware of their competitors and need

to be able to respond to that. Before it was quite clear who your competitors were, however over the course of the years new parties are suddenly emerging. These competitors are completely different companies that before and are set up very differently. As stated by Participant F: *“With current advancements in digitalization (and globalization) the way organizations innovate is different and more important than ever. And every industry is unique in that regard, for example in the banking sector it was already clear 5 years ago While for other industries, like engineering, the realization is now.”* The role of competitors is also evident in the case of Recruitment1. A very important impulse for their digital transformation was Microsoft’s acquisition of LinkedIn. As this tech giant has invested in a large digital player in the recruitment sector, the urgency of digital has become clear. That was a direct driver to accelerate their digital efforts. To anticipate to such developments, Recruitment1 has established a team with analysts, strategists, innovators, etc. who monitor the external environment extensively. This traditional team is there to evaluate trends, competitors, start-ups, customer needs etc.

Competitor screening can be achieved by Consultant1 through the use of a competitor analysis, such as Gartner’s Magic Quadrant. Gartner’s Magic Quadrants is a research methodology and visualization tool that helps to monitor and evaluate the process and position of companies in a specific, technology-based market. These magic quadrants use a two-dimensional matrix to compare organization on their ability to execute versus their completeness of their vision. These quadrants can be used as a helpful tool for organizations to analyse their competitors.

#### ***Perform industry benchmark analysis***

A method that helps organizations to improve their ability to scan for competitors is by performing an industry benchmark analysis. This can for example be done by distributing a survey to several organizations regarding a specific topic and ask their opinion. For example, Consultant1 has performed an industry benchmark regarding firms’ orientation towards servitization. Performing an industry benchmark can help to assess the value and relevance of potential business opportunities. As Participant G states *“the objective is to get insight in the status of a certain topic and to compare your maturity with other companies.”* By understanding an organizations current position with respect to its competitors can help to estimate the urgency of certain business opportunities. Especially in the digital field, such analyses are often used to assess new digital trends.

#### **5.1.2 Integrate customers into the ideation phase**

The ability to *integrate customers into the ideation phase* is derived from an empirical and theoretical analysis. The results of this analysis are summarized in table 8 and each element is elaborated in the text below.

Table 8 Capability & interventions: integrate customers into the ideation phase

Critical capability	Theoretical support	Interventions	Digital relevance (based on Nambisan et al. 2017)
Integrate customers into the ideation phase	<ul style="list-style-type: none"> <li>Needs-driven &amp; value-based digitalization (Kokshagina (2021)</li> <li>Integration of customer into the ideation phase (Witschel et al., 2019);</li> <li>Build direct and emotional relationship with customers (Matarazzo et al., 2021);</li> </ul>	<ul style="list-style-type: none"> <li>Interact with customers through digital solutions</li> <li>Validate customer needs through digital communities</li> <li>Gather customer insights through data analytics</li> </ul>	More interaction between innovation processes and outcomes

### ***Interact with customers through digital solutions***

Digital solutions have also been indicated to provide more opportunities for customer interaction. As most consumers are tech savvy, they require content service through smart devices, social media and IoT, forcing firms to compete harder and focus on creating customer experiences rather than only selling goods. As pointed out by Participant E: *“The modern customer demands so much more. They expect two-way conversations with brands, keeping them interested and making them want to stick around. And they want all that online where they spend most of time of their everyday lives.”* This has been further supported by Participant L: *‘A people centric view of the world and a system view world are going to be absolutely key. In the exploration team, you need creative solutions to solve customer problems end to end. (...) In the world of digital innovation, you need to have a little spark and take some risk get to know your great aunt and next-door neighbour to really get to know their pains.’* With a clear understanding of customer engagement, and how it will develop in the future, companies should be able to stay one step ahead of competition. Digital customer engagement is about using digital tools - think social media, AI, data analysis and beyond - to find, listen, and interact with your customers. Every channel or method organizations use to connect with customers - from the very first touchpoint to well beyond the point of purchase - relates to digital customer engagement. By offering customers something extra on top of usual products and services can help to forge an emotional connection and strengthen the relationship with customers.

### ***Validate customer needs through digital communities***

A solution that has been specifically offered and developed by Consultant1, is using digital communities to validate customer needs. This digital tool helps businesses to understand and exploit the complex interplay between customers, brands and the digital world. As they Participant L states *“I believe that understanding the human side of the digital world is essential to all businesses, using digital communities allows us to offer validated offering more swiftly.”* By combining customer research and digital communities this solution helps organizations with predicting how consumers think and behave in the digital world. As Participant O points out *“this means we can continuously identify new customers. Interacting with customers in several ways helps to tremendously reduce the interaction cost per customer, allowing you to interact continuously with customers.”* Customer needs, behaviours and expectations are changing at an unprecedented pace. With new ways to create value, the traditional distinction between products and services is blurring. As many markets are being disrupted by new entrants, organizations get even closer to their customer and create relevant products fast.

### ***Gather customer insights through data analytics***

From the results of this study this customer insights can mainly be achieved by using data in an efficient way. As been addressed by Participant E: *"companies need to make sure that data is used for decision. We currently hear a lot about big data, but it is important to remember that gathering data is just the first step."* Companies do have a lot of data and companies need to use it and capitalize on it. Latest trends like connectivity (5G), AI & IoT offer organizations the possibility to access real-time data from anywhere anytime. Thus, with the large amount of data, social media, and customers preferences, it is impossible to make a fast decision without technology. Therefore, it is crucial to turn those bits and bytes into actual knowledge that can provide actionable insights about markets, customers or other opportunities. As Participant E states *"Businesses fail to use about 80% of the customer data they collect right now. Many invest millions of dollars into gathering data, produce great insights on one side of the organization, but then don't follow with a clear sense of how to turn that knowledge into actionable insights."* Several new digital technologies increase the amount of data, but also increase its complexity. Furthermore, data can be used for several purposes. As Participant I mentions *"data can be used on one hand to get a very clear picture of changing market demands, and partly this data can be used to respond smartly by adapting products to these needs."* This eventually can help to put products on the market in a better and more targeted way. Furthermore, the real-time nature of customer insights allows organizations to be agile, acting quickly to keep up with customer desires and expectations to stay relevant. Effective segmentation and analysis of data can help organizations to better understand context and allow offering more tailored solutions to customers. As Participant A notes *"companies are increasingly looking at personalized offerings, where companies are offering products based on the characteristics and needs of the customers."* Furthermore, Participant O address *"For a large manufacturer we have experimented with a replenish model, which delivers restocks to consumers based on sensors and accompanied inventory data."* Thus, consumers demand much more personalized products and want them to be perfectly adopted to their needs.

## **5.2 INTERVENTIONS FOR DIGITAL TECHNOLOGY SENSING**

Continuous sensing for new technologies has been named as relevant for digital business model innovation. As Participant F names: *'organizations should ask: Is there a new technology that will allow us to solve this problem? But if that right technology is not there yet, it can suddenly appear in a week after. Therefore, you need to continuously keep this in the process.'*

### **5.2.1 Collaborate with external partners for ideation**

The ability to *collaborate with external partners for ideation* is derived from an empirical and theoretical analysis. The results of this analysis are summarized in table 9 and each element is elaborated in the text below.

*Table 9 Capability & interventions: collaborate with external partners for ideation*

Critical capability	Theoretical support	Interventions	Digital relevance (based on Nambisan et al. 2017)
Collaborate with external partners for ideation	<ul style="list-style-type: none"> <li><i>Involvement of external partners during the ideation phase</i> (Witschel et al., 2019)</li> <li><i>open innovation</i> (Day &amp; Schoemaker, 2016)</li> </ul>	<ul style="list-style-type: none"> <li>Establish start-up scouting team</li> <li>Establish start-up accelerator</li> </ul>	Distributed innovation agency

- *Dialog and integration with external stakeholders* (Inigo et al., 2017).
- *Open innovation through the digital technologies* (Urbanati et al., 2020)

- Set up corporate investment fund

Evident in this case study is a firm's ability to collaborate with their environment. As Participant I states, *"Organizations need the capacity to do ecosystem monitoring; how do you ensure that you are constantly monitoring what is happening in your ecosystem."* To do so it is of vital importance to understand the start-ups field, as a large part of the innovation is located there. Furthermore, collaborating with start-ups is not only important to help understand technological trends, but it also helps to possess the strategic ability to act upon new opportunities. In this regard, there are primarily three interventions offered by participants to develop this capability.

#### ***Establish start-up scouting team***

First, a solution that can be provided to help improve this capability is by establishing a start-up scouting team. As Participant K points out: *"within Finincial2 we had a separate FinTech team that was doing nothing else than scout the market for new technologies and technology start-ups to start proof of concepts with them."*

#### ***Implement start-up accelerator***

Second, is to implement a start-up accelerator that collaborates with start-ups and helps them to grow. As Participant I defines: *"set up an accelerator program, which offers a platform for start-ups to help them roll out their concepts faster. This can help bring corporates closer to the innovation in their sector."* Several of these technological solutions can be very relevant for teams that are looking for new business opportunities. When a technology is proven to provide value for customers by other start-ups it becomes interesting to explore more extensively.

#### ***Set up corporate investment fund***

Third, other than scouting and collaborating with start-ups, corporates can also invest in start-ups by establishing a corporate investment fund. As Participant I notes: *"An investment fund is a very useful tool to develop lots of knowledge and understanding of start-ups."* A corporate investment fund (i.e., corporate venture capital) is the investment of corporate funds directly in external start-up or scaleups. The objective of an investment fund is primarily for its strategic benefits. Here the company seeks to identify and exploit synergies between itself and a new venture that can help them to develop new business models. As Participant A adds: *"Creating an investment fund forces corporates to build the capabilities needed to understand the start-up market. This helps to understand the types of innovation that are being developed and what are the most interesting start-ups. Furthermore, this also provides an opportunity to prepare for the future by investing in possible competitors."* To implement this Financial1 have reorganized its complete collaboration process to improve efficiency and effectiveness. This process has been optimized from scouting till implementation of start-ups based on best-practices, governance forms and responsibilities.



### 5.2.2 Interpreted value of external environment

The ability to *interpreted value of external environment* is derived from an empirical and theoretical analysis. The results of this analysis are summarized in table 10 and each element is elaborated in the text below.

Table 10 Capability & interventions: interpreted value of external environment

Critical capability	Theoretical support	Interventions	Digital relevance (based on Nambisan et al. 2017)
interpreted value of external environment	<ul style="list-style-type: none"> <li>• <i>Digital scenario planning</i> (Warner &amp; Wäger, 2019);</li> <li>• <i>Modelling of value proposition and value capturing mechanisms</i> (Witschel et al., 2019);</li> <li>• <i>Combine sensing with in dept knowledge</i> (Helfat &amp; Raubitschek (2018);</li> <li>• <i>Calibrating</i> (Yeow et al., 2018);</li> <li>• <i>Knowledge exploitation capabilities</i> (Soluk et al., 2021)</li> <li>• <i>Recognize the value of external information</i> (Steininger et al., 2022);</li> </ul>	<ul style="list-style-type: none"> <li>• Conceptualize the business model prototype</li> <li>• Search for technological trends</li> </ul>	Not specific for digital

#### ***Conceptualize the business model prototype***

To interpreted value of the external environment, a solution that is offered by Consultant1 is an ‘art of the possibility’ ideation session to conceptualize an initial business model prototype. This pressure cooker helps organizations to solve large business challenges inspired by innovations across sectors and key developments in the external environment. This stepwise process starts by identifying the most pressing business challenges for the organizations by reviewing existing customer and performance data. Accordingly, this data insights are used to facilitate the pressure cooker that explicitly links challenges to solutions to define valuable business cases. Eventually rapid digital experimentation is offered to make an initial data driven evaluation of the first conception of the business model prototype.

#### ***Search for technological trends***

A specific solution for scouting new technologies offered by Consultant1 is an AI tool called ‘Dark Matter’. This tool helps organizations to look beyond traditional search engines by using AI to look into directions that were previously unknown. This can help to identify trends and technologies that can potentially impact or disrupt business in the long run. As been notified by Participant O “we have used dark matter to uncover new possibilities for several multinational organizations, from discovering future technologies to finding new acquisition opportunities.”

### 5.3 INTERVENTIONS TO DEVELOP AND DESIGN BUSINESS MODELS

There was a clear trend among participants and case studies when operationalizing capabilities to seize digital opportunities. Almost all participants referred to the close resemblance of seizing with their innovation methodology. Participant K describes “*seizing is the task of an innovation team, who have a designated structure, process, governance, budget and expertise to prepare and develop new opportunities and eventually bring them back in the business.*” This method facilitates business model innovation by implementing an innovation operating model. This approach is centred around cross-functional team collaboration to help to overcome growth challenges and embed a growth-driven mindset in organizations. First, a central aspect of this methodology is the establishment of a *digital accelerator* to seize digital opportunities.



This digital accelerator is blending design thinking (for customer centricity), lean start up (for fact-based experimentation) and agile (for heartbeat iterations). As Participant F describe “for seizing it is important to establish a digital accelerator that enables thorough research, customer validations, and experimentation.” When set up correctly, it will help organizations to make an informed decision based on a comprehensive analysis. Second, participants have also proposed to implement a digital prototype platform that helps to rapidly develop, implement, and test digital prototypes. Lastly, central in the case study is the establishment of a digital centre of excellence to build and unite entrepreneurial digital capabilities at corporate scale.

### 5.3.1 Rapidly develop, validate, and experiment with digital business models

The ability to *Rapidly develop, validate, and experiment with digital business models* is derived from an empirical and theoretical analysis. The results of this analysis are summarized in table 11 and each element is elaborated in the text below.

Table 11 Capability & interventions: Rapidly develop, validate, and experiment with digital business models

Critical capability	Theoretical support	Interventions	Digital relevance (based on Nambisan et al. 2017)
Rapidly develop, validate, and experiment with digital business models	<ul style="list-style-type: none"> <li>• <i>Agile working</i> (Fellenstein, J., &amp; Umaganthan, A. (2019);</li> <li>• <i>Rapid prototyping</i> Warner &amp; Wäger (2019);</li> <li>• <i>Innovation capabilities</i> Helfat &amp; Raubitschek (2018);</li> <li>• <i>Appropriate organization of development competences</i> (Witschel et al., 2019);</li> </ul>	<ul style="list-style-type: none"> <li>• Embed agile way of working</li> <li>• Implement the lean start-up methodology</li> <li>• Implement prototype platform</li> <li>• Establish digital center of excellence</li> </ul>	Less bounded innovation outcome & more interaction between innovation processes and outcomes

#### ***Embed an agile way of working***

Agile working has become well-known over the past years and has been proven especially useful with the rise of digital technologies. Participant O states that that within innovation there are two developments “*first is the application of agile on innovation, which means you have more customer interaction, and furthermore you combine agile and stage-gate with each other.*” This prevents you from taking for example half a year to only find out that something is not working. When Agile and Stage-gate are combined you get way more iterations between each stage, so you have fewer large pivots. By providing frequent releases and continuous feedback within the development life cycle, organizations can focus on deliverables that are small enough to deliver in short increments. As Participant O addresses “*indeed, customers are changing their preferences more frequently than before, but the main reason to work iteratively is to rule out uncertainties.*” The uncertainties in innovation are mainly three: technological feasible, customer desirable, and business viable. Agile innovation works, there where there is uncertainty. When things are changing more frequently, such as in digital environments, the adaptability of an organization becomes interesting. As Participant O continuous “*for digital solutions it is easier to try out stuff, because of its reprogrammability.*” This is different for non-digital products which need several checks and securities before the actual product can be brought to market.

#### ***Implement the lean start-up methodology***

As implemented by Financial1 and Financial2, the lean start-up methodology forms an important method for seizing new business opportunities. Participant I state “*One component*

of our accelerator is the lean start-up methodology. Which is about very short iteratively developing products that you test non-stop on viability." This intervention has been implemented in as part of an innovation process at each of the case companies.

### ***Implement prototype platform***

Given the rapid developments it is often hard for organizations to know where they should be investing in. According to Consultant1 quick customer validation is the answer for this challenge and requires prototyping capabilities which often lacks in legacy infrastructures. Therefore, Consultant1 offers a lab platform that allows organizations to build proof-of-concepts demonstrator and prototypes together with technology partners (e.g. Google, AWS, Invision, Wix etc.). This platform is developed in combination with agile software engineers and user-experience designers, which allows organizations to quickly test ideas with users to proof the business value before any large investments are made.

Participant O states: *"These digital predictive models are now primarily being used in horizon 1 projects. They aim to build prototypes by configuring the right product features based on the customers profile."* Using such deterministic digital models can for example help to exactly define the composition of laundry detergent, toothpaste or coffee beans based on available data. This can tremendously increase your development process by performing instant tests based on previous tests data, instead of taking several weeks. *"So, by applying digital, in combination with agile, you can really create an adaptive innovation capability."* - Participant O. Eventually this will help to develop prototypes at higher speed while gathering feedback for continuous improvements. This provided the ability to leverage from a development platform without needing to make large scale investments. Furthermore, it can help to facilitate a dialog with relevant stakeholders for quicker validation of new product solutions.

### ***Establish digital centre of excellence***

A central element in the digital business model transformation approach of Consultant1 is the development of a *digital centre of excellence*. This intervention is aimed to bring together digital capabilities by establishing an operating model and way of working for sharing, reusing and collaboration on digital initiatives. As Participant N states *"We see that digital entrepreneurship and initiative evolves locally. It is not something that can be managed top down. However, at a certain point, local proven digital innovations are ready for scaling up."* This method differentiates from *communities of practice*, because a centre of excellence has more distinct authority over selecting and aligning methods, ways of working, and technology usage.

Within Recruitment1, experiments with digital technology happened in many of the operating countries, which made digital innovation expensive and caused long time to market by reinventing the wheel too often. Due to various operating platforms, the company lacked sharing of proven best practices across the company. By establishing a uniform corporate operating model, digital services can be effectively used throughout the organization. A team of digital experts, headed by a chief digital officer, helped to support cross company scaling by generating ideas for using technology, prototypes and digital resources. As Participant I emphasize *"Digital innovation often has something to do with technology. And technology has a lot of efficiencies to gain if you do that in a more centralized way."*

Establishing a *digital centre of excellence* starts by choosing the right operating model based on the digital maturity of the organization. Base on the maturity stage of an organization various operating models can be selected (e.g., centralized vs. decentralized, local vs. global, etc.). To get the right balance between centralized efficiency and decentralized responsiveness Recruitment1 have accompanied the centre of excellence with a *Hub & Spoke operating model*. This model provides clout to build up certain digital capabilities centrally, while keeping certain capabilities in the business units to preserve decentral autonomy and responsiveness. Subsequently, a services catalogue is developed that clearly defines the services the centre will be offering. Services can range from digital acceleration, rapid prototyping, and proof of concepts to the development of digital skills and competences to lead the transformation. Lastly, new ways of working enable continuous sharing, collaboration and re-use which enacts a digital mindset. In essence, value is created by embracing locally proven digital innovation, making it widely accessible and enabling other business units to expand this. Eventually the centre of excellence will drive new innovation that require capabilities that are not available elsewhere.

### 5.3.2 Continuous customer integration into the development process

The ability to *Rapidly develop, validate, and experiment with digital business models* is derived from an empirical and theoretical analysis. The results of this analysis are summarized in table 12 and each element is elaborated in the text below.

Table 12 Capability & interventions: Continuous customer integration into the development process

Critical capability	Theoretical support	Interventions	Digital relevance (based on Nambisan et al. 2017)
Continuous customer integration into the development process	<ul style="list-style-type: none"> <li>Continuous customer integration into development process Witschel, Döhla, Kaiser, Voigt &amp; Pfltschinger (2019).</li> <li>External partnerships (Fellenstein, J., &amp; Umaganthan, A. (2019);</li> </ul>	<ul style="list-style-type: none"> <li>Engage in design thinking</li> </ul>	Less bounded innovation outcome & more interaction between innovation processes and outcomes

#### *Engage in design thinking*

To integrate customers in the development process design-thinking has been proposed in this case study. Design thinking has been introduced to drive outside-in thinking which helps to solve validated customer problems with suiting solutions. In this method customers are put at the centre or the innovation. *“So, at Financial2 for example, design thinking is a method to teach employees to put themselves in the feet of a user. What are their needs? What are their pain points?”* – Participant H. Solutions are based around hypotheses until they have been validated with data. Eventually this will help organizations with driving customer centricity to truly understand customer needs and desires. Furthermore, it will encourage creativity and out-of-the-box thinking to generate unique solutions to existing problems. And lastly it helps to deliver business models that customers really need. As participant I state, *“design thinking, helps to think from the perspective of customer problems and come up with solutions by quickly making a prototype to see whether it actually solves the customer problem.”*

## 5.4 INTERVENTIONS TO COORDINATE BUSINESS MODEL INNOVATION

In the case study, when seizing digital opportunities or threats it has been addressed by participants to establish a management structure that enables coordination and strategic alignment of innovation activities. Having clear innovation governance is key to quickly moving from acceleration to scaling, set aside budget for disruptive innovations and involve the right stakeholders in the innovation and decision-making process. Therefore, a management structure is needed to establish the organizational boundaries, manage decision making processes, manage the innovation portfolio and measure innovation performance. Dictating a business model innovation process requires several decision-making activities that asks for specific capabilities and protocols. Firstly, it requires a governance structure that is separated from the traditional organization with different metrics and objectives. Secondly, it requires another type of leadership and decision-making. This requires having strategic leaders who can delegate digital innovation processes and base their decision on extensive analysis and data.

### 5.4.1 Strategic align digital business model innovation

The ability to *strategic align digital business model innovation* is derived from an empirical and theoretical analysis. The results of this analysis are summarized in table 13 and each element is elaborated in the text below.

Table 13 Capability & interventions: strategic align digital business model innovation

Critical capability	Theoretical support	Interventions	Digital relevance (based on Nambisan et al. 2017)
Strategic align digital business model innovation	<ul style="list-style-type: none"> <li>• <i>Digital strategy development</i> (Ellström, Holtstrom, &amp; Johansson (2021);</li> <li>• <i>Strategic agility</i> (Warner &amp; Wäger (2019);</li> <li>• <i>Strategic orientation towards digitalization</i> (Arias-Pérez et al., (2021);</li> <li>• <i>A digital strategy that defines a SMACIT-inspired value proposition</i> (Sebastian et al. (2017);</li> <li>• <i>Strategy guides business model design</i> (Teece (2018b)</li> </ul>	<ul style="list-style-type: none"> <li>• Align innovation with digital strategy</li> <li>• Define digital growth areas</li> <li>• Define digital milestones &amp; objectives</li> </ul>	Less bounded innovation outcome & more interaction between innovation processes and outcomes

#### *Align innovation with digital strategy*

As for each case in this study, a first step when seizing new opportunities is to have an action plan that is derived from the overall organizational strategy. Aligning the direction for innovation with the corporate strategy ensures innovation investments empower your business. As Participant H states *“digital innovation is eventually a means to reach your organizational objectives.”*

As Participant K state: *“In order to change you need to have a clear strategy as main starting point. Then you need to link your innovation strategy to the digital strategy because it needs to be supported by your vision and mission.”* Participant F supports this by providing an example: *“for example when Financial2 wants to realize a digital banking app its first stated this ambition in its strategy. This is their starting point. Then it is clear for your organizations but also for other stakeholders such as shareholders.”*

### **Define digital growth areas**

To coordinate business model innovation, it is important to understand market and technology trends, to identify where to play and how to win as an organization. Based on an organization's strengths and competences, it can then determine which growth areas are most vital for the company. As participant K addresses *"Based on your strategy you define your growth areas and strategic domains. These strategic domains serve as a guideline for your innovation team to search for opportunities within this ecosystem."*

### **Define innovation milestones & objectives**

Lastly, it is essential to define innovation milestones and to establish clear and tangible objectives. This helps to measure progress and prioritize. For Financial2 to succeed in their digital ambitions it was essential that their innovation organization was in line with their strategy. This helped them to prioritize, distribute and focus on specific themes within each business unit. An example from practice can also be given by Recruitment1 where C-level executives were not completely aligned on the strategic direction. To solve this, they engaged in *business wargaming*, this military inspired game helps with strategy development based on scenario modelling to identify opportunities and threats in different scenarios. Eventually this results in board level alignment on the right direction in a rapidly changing digital environment. Furthermore, for Financial2 to succeed in their digital ambitions it was essential that their innovation organization was in line with their strategy. This helped them to prioritize, distribute and focus on specific themes within each business unit.

#### **5.4.2 Balance digital portfolios & manage strategic investments**

The ability to *strategic align digital business model innovation* is derived from an empirical and theoretical analysis. The results of this analysis are summarized in table 14 and each element is elaborated in the text below.

*Table 14 Capability & interventions: balance digital portfolio & manage strategic investments*

Critical capability	Theoretical support	Interventions	Digital relevance (based on Nambisan et al. 2017)
Balance digital portfolios & manage strategic investments	<ul style="list-style-type: none"><li>• <i>Balancing digital portfolios (Warner &amp; Wäger (2019);</i></li><li>• <i>Digital asset investment (Fellenstein, J., &amp; Umaganthan, A. (2019);</i></li><li>• <i>Determine enterprise boundaries (Ellström, Holtstrom, &amp; Johansson (2021);</i></li></ul>	<ul style="list-style-type: none"><li>• Define digital funnel blueprint</li><li>• Establish central innovation board</li><li>• Define digital innovation metrics</li></ul>	Distributed innovation agency & more interaction between innovation process and outcome

### **Define digital funnel blueprint**

Within three case studies (Financial1, Financial2, and Recruitment1) there was attention for digital portfolio management. In order to innovate effectively a centrally steered innovation portfolio is needed to focus on important growth areas and prioritize efforts. To realize this, it is important for organizations to map their current innovation portfolio and provide an 'horizon review', this helps to identify gaps and overlaps and how to innovation efforts can be combined. As stated by Participant I: *"We have portfolio management, which is of course an important issue. How do you set up an effective portfolio of innovations that deals with the uncertainty of knowing that 90 out of 100 innovations fail?"* Portfolio management is needed to deal effectively

with uncertainty associated with innovation. This requires several methods and activities to help reduce this uncertainty, for example by implementing a stage-gate model or by prioritizing projects based on the agile WSJF (Weighted Short Job First) methodology. Participant I for example, has mentioned that for the digital transformation of Recruitment1 they have implemented a central portfolio management system that has improved efficiently and effectivity of innovation decisions.

#### ***Establish central innovation board***

In order to maintain a long-term focus for your organization, innovation should be managed centrally. Previously, innovation within Financial2 was primarily organized decentral within each business unit. As a result, their innovation focus was mainly on the short-term and not on higher-risk H2 and H3 innovation. By establishing an innovation board, innovation is steered more centrally and on the long term. This way the management board had a more prominent role in innovation and the sponsoring of specific themes. As stated by Financial2: *“by putting the innovation one level higher to make it more important, but also to get more clout and more decision-making power for innovation teams.”* Furthermore, resources are allocated and balanced cross business unit on strategic themes for all horizons of growth. This helped to balance short- and long-term innovation investments and aligned resources with their ambitions. A similar approach has also been taken within Financial1. Where Participant F states *“leadership tends to focus on short term result, so to focus on the long term you need to balance your innovation portfolio. Typically, we follow a distribution of 70%, 20%, 10% for each horizon.”* In order to develop new digital business models, it is therefore important to distribute your organizational efforts and risks. Eventually some projects will fail, and some will succeed, so by balancing the right portfolio organizations will eventually succeed.

#### ***Define digital innovation metrics***

Besides a balanced innovation portfolio, successful coordination of digital innovation also requires specific performance metrics. By setting clear, relevant success metrics for the innovation projects throughout the funnel, organizations can align their leadership team and track the evolution of projects. At Financial1 a digital scaling funnel was implemented to focus on innovation besides its existing operations. *“This requires an ambidextrous organization where innovation is steered on different metrics than the traditional organization.”* - Participant F. Scaling new business opportunities requires an organizational structure that steers projects based on specific innovation metrics. For example, digital business models often have totally different value capturing mechanisms and revenue streams than traditional products. In particular for digital platforms, it might be more important to build a community of loyal customers before looking further into monetizing your business. Therefore, when working on disruptive innovative projects it's often hard and not desirable to use traditional metrics of an organizations. Thus, organizations could follow similar metrics from start-up and design thinking world.

## **5.5 INTERVENTIONS FOR INTEGRATION CAPABILITIES**

For integration capabilities several interventions have been identified that are displayed in the sections below.

### 5.5.1 Enhance internal knowledge exchange and integration

The ability to *enhance internal knowledge exchange and integration* is derived from an empirical and theoretical analysis. The results of this analysis are summarized in table 15 and each element is elaborated in the text below.

Table 15 *Capability & interventions: enhance internal knowledge exchange and integration*

Critical capability	Theoretical support	Interventions	Digital relevance (based on Nambisan et al. 2017)
Enhance internal knowledge exchange and integration	<ul style="list-style-type: none"> <li>• <i>Enhance know how exchange and internal communication</i> (Witschel et al., 2019);</li> <li>• <i>Knowledge management</i> (Teece 2007)</li> <li>• <i>Internal Integrative capability</i> (Helfat &amp; Raubitschek, 2018)</li> </ul>	<ul style="list-style-type: none"> <li>• Develop integrated technology platform</li> </ul>	Distributed innovation agency & emergence of digital platforms

#### ***Develop integrated technology platform***

When analysing each case, the role of an integrated technology platform (i.e., IT) for digital business model innovation cannot be overlooked. As Participant L states *“digital and especially the next phase in digital is about connectedness”*. This refers to the interconnectivity of several elements in the business model and the organizations. As Participant E address *“The most fundamental technology enabler (or inhibitor) of transformation is a digital infrastructure of appropriate data and processes.”* Many companies have historically operated in silo’s, each with their own systems, data, definitions and business processes. In order to advance in digital, organizations need to establish a common view of customers, products, processes and systems. Thus, *“in order to prepare for digital, companies need to invest (heavily) in integrating data and processes across the organization.”* - Participant C. With the growing importance of tech and data, businesspeople can no longer put it in a separate department; technology has been constantly present throughout every part of the organization. Therefore, business can only thrive when businesspeople understand how technology works and how to talk about it. As also Participant E addresses *“digital business development, more than other business changes, require strong interaction between technology and business executives.”* Companies where business and IT are well integrated have a better position to capture digital business opportunities. As Finanical1 put it *“IT has been brought closer to business during the last five years, it is very important for the success because many of the new business opportunities are enabled by technology.”*

Based on the case study three maturity levels for an integrated technology platform are identified. First, a fundamental IT architecture is put in place that forms the foundation for an organization’s core capabilities. This provides a secure and scalable technology foundation, to follow and support an organizations digital strategy and business model. Participants C addresses *“It is very important to invest in a technology platform and the standardization of it. Although many organizations can function very well with several platforms or systems that are cobbled together. It becomes a challenge when organizations want to scale to something more robust that has the adequate space to host different ideas in an efficient manner.”* Second, a solution architecture provides a modular and adaptive technology platform that can provide organizations with clever insights of its total ecosystem, including customers, suppliers and



business partners. This allows organizations to modify or build new solutions and systems to support new business models. Lastly, when an organization has designed the platform fundamental and key integrations, the firm is ready to exploit its data driven opportunities and establish a fully integrated technology platform. This fully integrated technology platform has commonly been referred to as a 'digital enterprise platform', which is the most advanced form of IT integration. Digital enterprise platforms recombine existing technologies and systems through intelligent integration and orchestrations, which support digital transformation by creating new digital capabilities, digital business models or processes. The interconnected tech platform provides scalability for application, serving both CX and UX of the business. It allows for real-time data discovery, data-driven decision making and integrates other (legacy) data sources systems. With the wide variety of digital technologies, such as 3D printing, drones, IoT, AI, recombination and convergence are forcing businesses to integrate these technologies to create new and disruptive capabilities. For example, organizations need to have a platform that collects all customer characteristic and can translate these into customer needs. As Participant G explains "So you can have a number of platforms that can help to can translate an idea or a need into a tangible offering. By combining data from multiple sources organizations are better able to predict customer demands." Each application for such a platform depends on whether you are a software company, a bank, a manufacturer or a service provider.

### 5.5.2 Scale business model through partnerships and digital ecosystems

The ability to *scale business model through partnerships and digital ecosystems* is derived from an empirical and theoretical analysis. The results of this analysis are summarized in table 16 and each element is elaborated in the text below.

Table 16 Capability & interventions: scale business model through partnerships and digital ecosystems

Critical capability	Theoretical support	Interventions	Digital relevance (based on Nambisan et al. 2017)
Scale business model through partnerships and digital ecosystems	<ul style="list-style-type: none"> <li>Externally-oriented integration capability (Helfat &amp; Raubitschek (2018))</li> <li>Navigating innovation ecosystem Warner &amp; Wäger (2019);</li> <li>Digital intensity (Sousa-Zomer, Neely, Martinez (2020);</li> <li>business ecosystems have become increasingly important (Teece (2018b));</li> </ul>	<ul style="list-style-type: none"> <li>Introduce an accelerator for start-ups</li> <li>Establish a digital platform business</li> </ul>	Distributed innovation agency & emergence of digital platforms

#### ***Introduce an accelerator for start-ups***

All companies in the case study have implemented several organizational structures and methods that allow them to collaboration with external partners. Partnering can be used to enable an actual business model transformation or to support innovation activities. Participant O notes "when collaborating with external parties there are mainly three types of collaborations. First is the academic world for front-end innovation. Second are large suppliers that have profound R&D capabilities. And lastly there are start-ups." Throughout the case data, collaboration with start-ups has mainly been addressed.



Similar when collaborating with external partners for ideation (chapter 5.2.1), corporates have implemented several organizational structures and tactics that enable easy collaboration with external scale and start-ups. First, organizations can establish a corporate fund which invests in shares of start-ups and scaleups. Within Recruitment1 the establishment of an investment fund helped on one hand to enhance the sensing of new technologies, and on the other hand it helped to invest and integrate start-ups within the organizations. Second, a start-up accelerator can focus on setting up proof of concepts with technical partners. Within Recruitment1, the accelerator helped to integrate an acquired tech start-up throughout the organization. This central unit helped to implement the solution locally by establishing guidelines, onboardings, trainings and IT integration advice. This provides a perfect example were its more efficient to guide certain capabilities centrally.

***Establish digital platform business***

And lastly, is the establishment of a digital platform business. Platforms help to build an ecosystem that can facilitate valuable interaction between producers, suppliers, customers, and organizations. As Participant L addresses for the financial sector: *“We can see a massive trend for digital, which is all about connectedness. Companies aren’t going to succeed individually anymore; they have to become ecosystem players and succeed through partnerships. For example, traditional banking services like providing mortgages or investment products are being taken over by several players that fulfil parts of the value chain an create an ecosystem.”* Organizations can either lead and orchestrate an ecosystem or choose to join an ecosystem and create value. For example, whin Financial1 a central aspect of their digital innovation efforts is the establishment of digital platform. As the financial sector has already been digitalized tremendously the need to operate as a platform has been profound. As Participant B states *“when operating in a high-tech digital environment, establishing a digital platform is essential to succeed.”*

**5.6 INTERVENTIONS OF ORCHESTRATION CAPABILITIES**

When developing new digital business models is has been addressed as essential to have an orchestration capability that allows to select and source business model specific competences and resources.

**5.6.1 Redesign and reconfigure organizational structure**

The ability to *redesign and reconfigure organizational structure* is derived from an empirical and theoretical analysis. The results of this analysis are summarized in table 17 and each element is elaborated in the text below.

*Table 17 Capability & interventions: redesign and reconfigure organizational structure*

Critical capability	Theoretical support	Interventions	Digital relevance (based on Nambisan et al. 2017)
Redesign and reconfigure organizational structure	<ul style="list-style-type: none"> <li>• <i>Organizational restructuring</i> (Fellenstein, J., &amp; Umaganthan, A. (2019);</li> <li>• <i>Future oreiented organizaiotnal design and transformation</i> (Witschel et al, 2019);</li> <li>• Decentralization and near decomposability Teece (2007);</li> </ul>	<ul style="list-style-type: none"> <li>• Incorporate outside-in organizational restructuring</li> <li>• Map operations with business activity model</li> </ul>	Distributed innovation agency & less bounded innovation outcome

	<ul style="list-style-type: none"> <li>• <i>Redesigning internal structures</i> (Warner &amp; Wäger (2019);</li> <li>• <i>Context for action and interaction</i> (Sousa-Zomer, Neely, Martinez (2020)</li> </ul>		
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***Incorporate outside-in organizational restructuring***

Evident in this case study when implementing digital business models, it needs to reconfigure parts of its internal structure. This requires a capability that can understand current operations and knows how to design and implement changes. As Participant F states: *“Each company has a certain context and each company must set itself up differently to realize it, which is unique for every organization.”* As every organization is unique and interconnected, reconfiguring parts of this organization requires an extensive contextual analysis. For example, in the context of digital, Engineering1 consist of two major business units where new digital solutions are aimed to overarching both these departments. Whereas Financial1, on the other hand, was already centrally organized with a digital office that was overarching each business unit. Because of the complexity and extensity of this tasks, organizations often collaborate with consultants that aim to advise them on the manner. As Participant N puts *“I think that’s one of Engineering1 biggest challenges for digital transformation, if not the biggest.”* Having an external project-based vision can help to overcome internal silo’s and provides the right expertise to guide this reconfiguration. In order to create this capability Engineering1 has invested in the stakes of an innovation and transformation consultant in order to accelerate its digital strategy and become a leading technology-enabled solutions provider. As Engineering1 state, *“This strategic partnership accelerates our strategy to become a leader in bringing greater innovation and creativity to respond to current-day challenges.”*

***Map operations with business activity model***

A tool that has been offered by Consulting1 that can assist in reconfiguring firms’ internal structure is a *business activity model*. The objective of a business activity model is to obtain insight in all the activities that are happening within your current organization. Subsequently this model can be used to map the impact and the reconfigurations of future business models. This will help to decide what activities needs to be retained, added or terminated. As Participant G put it *“I helped an organization with their tender process through a business activity model. By mapping each activity in this process, I was able to identify manual steps that could be digitalized and realized a paperless office strategy.”* A business activity model can be particularly useful when developing new digital business models, since manual steps throughout the process can easily be identified. For example, a chain of manual activities can easily be replaced by a line of code and a computer automation.

**5.6.2 Provision and develop digital competences**

The ability to *provision and develop digital competences* is derived from an empirical and theoretical analysis. The results of this analysis are summarized in table 18 and each element is elaborated in the text below.

*Table 18 Capability & interventions: provision and develop digital competences*

Critical capability	Theoretical support	Interventions	Digital relevance (based on Nambisan et al. 2017)
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Provision and develop digital competences	<ul style="list-style-type: none"> <li>• <i>Improving digital maturity (Warner &amp; Wäger (2019);</i></li> <li>• <i>Digital savvy skills (Sousa-Zomer, Neely, Martinez (2020);</i></li> <li>• <i>Sustainable provision and development of key competencies (Witschel, et al., 2019);</i></li> <li>• <i>Change management (Fellenstein, J., &amp; Umaganthan, A. (2019)</i></li> </ul>	<ul style="list-style-type: none"> <li>• Establish transformation office</li> <li>• Intelligence hub</li> <li>• Coach and collaborate</li> <li>• Interactive training programs</li> </ul>	Not specific for digital
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### ***Establishing a transformation office***

Furthermore, this study has emphasized the importance of having a capability that can select and source business model specific competences and resources. As Participant F addresses: “you need to set up a particular department that is responsible for realize new digital business models.” This department can have several responsibilities that are aimed at realizing and operationalizing new elements of a business model. This is often referred to as a transformation office. When developing digital competences organizations need to establish their organizational boundaries and carefully decide between internal and external competence development. For example, when an organization wants to develop an IoT platform, it is important to understand which providers are active and how these capabilities can be internalized. At Engineering1 this department is responsible for selecting data providers, orchestrating partners that offer digital solutions, and configuring the data lake solution. Thereafter, this department has to choose whether they want to hire data engineers themselves or through partners. When firms decide to build resources internally, it was mainly the result of a careful consideration and evaluation whether this specific competence or resource represents a core asset of the new business model. The establishment of such a department itself also requires a careful consideration regarding its position within the organization (e.g., central or decentral), its configuration, its governance forms, objectives and success criteria.

### ***Intelligence hub***

For the internal development of digital competences there are three interventions offered by Consultant1 firm. First, Consultant1 can help organizations to build and implement an intelligence hub that provides organizations with the right digital capabilities to consistently and proactively develop data insights.

### ***Coach and collaborate***

Second, Consultant1 helps organizations to develop digital knowledge on the job by supporting organizations throughout their digital projects. According to the principle: demonstrate, participate, imitate, self-direct digital insights are transferred by coaching and collaborating with business units.

### ***Interactive training programs***

Lastly, interactive training programs are realized by Consultant1 that enables organizations to build skills and competences to enable accelerated digital innovation throughout the organization. An example of competence development is provided from Financial2 who aimed to transform their business model into a more ‘digital bank’. They spotted the opportunity of unlocking business value from their data but lacked the competences and experiences to do

so. As a solution an advance data-analytics platform was realized that acted as a stand-alone department across organizational chains. This resulted in capitalization of several business benefits, being improved conversion rates, cost savings and stabilization. The internal staff was trained to promote the data service in business lines, resulting in a trained team that successfully generated customer insights, proactively innovated and was able to capitalize the business benefits.

## 5.7 COMPARISON BETWEEN THEORY-BASED AND PRACTICE-BASED INTERVENTIONS

In this paragraph the most important differences and similarities between theoretical and empirical results are discussed. Based on the systematic literature review displayed in Appendix C several theoretical interventions are identified. The comparison between theory-based interventions and practice-based interventions is displayed in table 19. This analysis has led to 101 interventions that help to build critical dynamic capabilities for digital business model innovation. Given the fact that they are all of significant importance, there are six critical capabilities that need to be addressed in particular.

First, with the rise of digital technologies firms' ability to *integrate customers into the ideation phase* has seen new ways so interact with customers and analyse their needs. Large amounts of customer data is gathered through digital artifacts, infrastructures and platforms and analysed by the advanced analytics and artificial intelligence (Nambisan et al., 2017; Sebastian et al., 2017). This research has emphasised the need for interaction with customer through digital solutions as well as a firm's ability to gather customer insight through data analytics. Furthermore, emerging business opportunities can be earlier identified and validated through the use of digital communities.

Second, given the disruptive nature of digital technologies, the data have emphasised the relevance of a firms *ability to rapidly develop, validate and scale business models through continuous and iterative innovation processes* (Rigby et al., 2016; Teece et al., 2016). Adopting entrepreneurial methods help to build organizations seizing capabilities and strengthen a firm's strategic agility and ability to balance digital portfolios. Hence, several well-known methods have been addressed in theory and practice over the years, such as agile, lean start-up and design thinking, which have proven their growing relevance in a digital age (e.g., Sebastian et al., 2017; Svahn et al., 2017; Warner & Wäger, 2019; Witschel et al., 2019). As these methods have also appeared in each of the case companies its value for digital business model innovation can be encouraged. Another intervention that has still been underexposed in literature but has proven to provide significant value for the case companies it the usage of a *digital centre of excellence*. This helps organizations to unite digital and innovative capabilities throughout the organizations and encourages decentralized innovation agencies to adopt uniform ways of working. This method facilitate innovation by offering shallow management hierarchies and decentralized authority while centrally govern and coordinate to archive long-term objectives (Teece, 2018a).

Third, is a firm's ability to *coordinate and strategic align digital innovation* has been addressed by theory as well as practice as an important capability for digital innovation (Achtenhagen et al., 2013; Teece, 2018b; Warner & Wäger, 2019). Because of the strategic character of digital business model innovation, research has emphasized the relevance of this strategic alignment.

Furthermore, as the digital innovation requires organizations to rapidly develop, validate and scale new business models, organizations need strategic agility to keep up in this fast-paced digital environment (Fellenstein & Umaganthan, 2019; Warner & Wäger, 2019). To improve this ability several interventions have been proposed in the case study such as agile stage-gates, digital innovation account metrics, innovation funds, digital portfolio management. Based on the organizational structure, context and objectives digital innovation is distributed either central or decentral.

Fourth, with the growing connectivity of digital technology platforms (e.g., IT), the data emphasises the relevance of *integration capabilities for internal interaction and knowledge exchange*. Advance digital infrastructures allow organizations to integrate processes, data, products and systems allowing to overcome business silos to facilitate innovation integration and agility (Ellström et al., 2021; Joshi et al., 2010; Karimi & Walter, 2015; Mikalef & Pateli, 2017). These advanced technology platforms often form the basis of innovative digital business models, through the use of CX, data, API integration, CRM, and HR. IT is therefore often seen as both an enabler as well as a barrier (i.e., legacy IT) for digital business model innovation. Advance forms of digital infrastructures have proven to provide organizations with a competitive advantage (Oswald & Kleinemeier, 2017). Furthermore, pooling digital capabilities through collaboration platforms provides organization wide access to otherwise scattered digital innovation capabilities, thereby enabling the organization to build on and re-use digital-resources, knowledge, ways of working, and services.

Fifth, following literature for reconfiguring, it has been evident that for realizing digital business models organizations need adequate *orchestration capabilities* (Nambisan et al., 2017; Teece, 2007, 2018a; Witschel et al., 2019). This capability helps organizations to source, evaluate and select new structures, processes, resources, competences and assets needed to support digital business model innovation. As found in each case, the development and implementation of digital business models often require large reconfigurations of organizational structure and competences. Therefore it is of paramount important that organizations possess the ability to redesign and reconfigure its organizational structure (Mezger, 2014; Teece, 2007; Warner & Wäger, 2019; Witschel et al., 2019), and develop the ability to reconfigure key competences (Sousa-Zomer et al., 2020; Warner & Wäger, 2019; Witschel et al., 2019).

The sixth capability that has been addressed in both literature as well as in practice is the importance of *external collaboration with partners* (Day & Schoemaker, 2016; Kreutzer et al., 2017; Westerman et al., 2014). All organizations in this case study have established an innovation fund and partnering strategy to enhance external collaboration. The effect of external collaborations and related coordination and integration processes is twofold. On one hand does the establishment of a partnering capability help with ideation and sensing of promising digital technologies. On the other hand, does it aid in the acquisition of external capabilities and competences through coordination and integration processes.

Table 19 Interventions in theory vs practice

Critical capabilities	Interventions related to critical capabilities	Theory	Practice
<b>Continuous business model sensing</b>			
<b>Scan and monitor the external environment</b>	1. Cross-industrial digital sensing	√	
	2. Searching for technological trends	√	
	3. Screening digital competitors	√	√
	4. Sensing customer-centric trends	√	
	5. Digital scanning and information management	√	
	6. Dedicated scouting structure	√	√
	7. Exchange with cross-divisional units	√	
	8. Industry benchmarking	√	√
	9. Participation in market surveys of customers	√	
	10. Analysis of best practices	√	
	11. Detailed evaluation of market potential	√	
<b>Interact with customers for ideation</b>	12. Co-creation workshops	√	
	13. feedback sessions with customers	√	
	14. Ideation phase with lead users	√	
	15. Voice of the customer program	√	
	16. Build customer relation through social networks	√	
	17. Needs driven digitalization & value-based innovation	√	
	18. Customer insights through data analytics	√	√
	19. Customer interaction through digital solutions	√	√
	20. Customer interaction and validation through digital communities		√
<b>Continuous technology sensing</b>			
<b>Collaborate with external partners for ideation</b>	21. Research cooperation with external partners	√	
	22. Building an ecosystem of strategic partners	√	
	23. Hackathons with external partners	√	
	24. Cross-industry networking	√	
	25. Start-up involvement	√	
<b>Recognize and interpreted value of external environment</b>	26. Analysing scouted signals	√	
	27. interpreting digital future scenarios	√	
	28. Formulating digital strategies	√	
	29. Specification of value proposition	√	
	30. Conception of the business model prototype		√
	31. Cross-industry imitation and adaption		
	32. Inside-out digital infrastructure sensing		
<b>Develop and design business models</b>			
<b>Rapidly develop, validate, and experiment with new business models</b>	33. End-to-end development	√	
	34. Communities of practice	√	
	35. Digital centre of excellence		√
	36. Agile way of working	√	√
	37. Creating minimum viable products	√	
	38. Lean start-up methodology	√	√
	39. Prototype platform (Wagner)	√	√
<b>Continuous customer integration into the development process</b>	40. Feedback systems for the design of services	√	
	41. Customer feedback after every iteration cycle	√	
	42. Piloting and testing services with lead user		
	43. Interaction and co-development with customers	√	
	44. Design thinking		√
<b>Coordinate and strategic align innovation</b>			
<b>Strategic align business model innovation</b>	45. Rapidly reallocating resources	√	
	46. Accepting redirection and change	√	
	47. Pacing strategic responses	√	
	48. Strategic orientation toward digitalization	√	√
	49. Strategic decision-making modelling	√	
	50. Semi-continuous adaptation of increasingly digitalized strategy	√	
	51. Align innovation with digital strategy	√	√
	52. Define innovation milestones & objectives	√	
<b>Balance digital portfolios &amp; managing strategic investments</b>	53. Balancing internal and external options	√	
	54. Scaling portfolio of innovative business models	√	√
	55. Setting an appropriate speed of execution	√	

	56. Making strategic investments in tangible and intangible assets	√	
	57. Prioritize digitalization projects based on digital strategy and evaluated resources	√	
	58. Determine enterprise boundaries	√	
	59. Define digital innovation metrics		√
<b>Integration capability</b>			
<b>Enhance internal knowledge exchange</b>	60. Offshoring of IT development activities	√	
	61. Outsourcing of IT development activities	√	
	62. Consistent data protection regulation	√	
	63. Customized design of the user interface	√	
	64. Data models and data analysis	√	
	65. Platforms and channels for information bundling	√	
	66. Special formats for regular exchange	√	
	67. Integrated technology platform	√	√
<b>Scale the business model through partnerships and digital ecosystems</b>	68. External partnership	√	
	69. Technology-based acquisitions	√	
	70. Joining a digital ecosystem	√	
	71. Interact with multiple external partners	√	
	72. Exploiting new ecosystem capabilities	√	
	73. Joint development with external partners	√	
	74. Cooperation with cross-industry partners	√	
	75. Integration of partners into the platform	√	√
	76. Introduction of an accelerator for start-ups	√	√
	77. Data exchange with partners	√	
<b>Orchestration</b>			
<b>Redesign and reconfigure organizational structure</b>	78. Implementation of an internal restructuring	√	√
	79. Scaling in separate unit	√	
	80. (Re)integration in existing structures	√	
	81. Fundamental renewal of the IT organization	√	
	82. Nimble and agile structure	√	
	83. Multi-divisional structure	√	
	84. Decompose digital transformation into specified projects	√	
	85. Design team-based structures	√	
	86. Change management	√	
	87. Power distribution	√	
	88. Organizational restructuring	√	
	89. Outside-in organizational restructuring		√
	90. Business activity model		√
<b>Provision and reconfigure key competences</b>	91. Digital savvy skills	√	
	92. Trainee program for digital talents	√	
	93. Identifying digital workforce maturity	√	
	94. External recruiting of digital natives	√	
	95. Leveraging digital knowledge inside firm	√	
	96. Internal competence development	√	√
	97. Implementation of dedicated learning platform	√	
	98. Workshops	√	
	99. Establish transformation office	√	√

## 6 DESIGN PROPOSITION

This chapter describes the formulation of design principles. Design principles support the design-science research approach by structuring and leading the process of developing solutions based on knowledge gained from both literature and practice (Denyer et al., 2008). The most informative design ideas, according to Aken & Romme (2009), are founded in theory and based on information from practice. The design proposition used in this study is based on a theoretical knowledge foundation gleaned from scholarly literature and supported by the findings of a multiple case study. Furthermore, generative mechanisms that relate management actions with outcomes are used to further anchor the design principles in organizational sciences (van Aken & Romme, 2009). Table 20 contains a list of final design principles.

### 6.1 DESIGN PROPOSITION

Table 20 Final design principles

Topic	Design principle
<b>Continuous business model sensing</b>	
<b>Ability to scan and monitor the external environment</b>	<ol style="list-style-type: none"> <li>1. <i>Particularly in volatile environments (C), it is important to have a dedicated scouting structure (I), to create an environment for innovation (M), to be able to scan and monitor the external environment (O)</i></li> <li>2. <i>Organizations undergoing a digital transformation (C) should screen for digital competitors (I), to foresee trends outside of their core industry (M) to improve firms ability to scan and monitor the external environment (O)</i></li> <li>3. <i>When operating in a fast- paced digital environment (C), Firms should perform an industry benchmark analysis (I) to compare your digital maturity with others (M) leading to an improved ability to scan and monitor the external environment (O)</i></li> </ol>
<b>Ability to integrate customer into the ideation phase</b>	<ol style="list-style-type: none"> <li>4. <i>When developing customer-centric business models (C) firms should interact with customers through digital solutions (I) to understand customer needs &amp; desires (M), to be able to integrate customers into the ideation phase (O)</i></li> <li>5. <i>When searching for digital solutions (C), firms should validate customer needs through digital communities (I) to improve a firm's ability to understand customer needs and desires (O) by predicting how customers think and behave in a digital world (M)</i></li> <li>6. <i>When operating in a competitive environment (C), Firms should gather customer insights though data analysis (I) to integrate customers knowledge in the ideation phase (O) which improves customer understanding (M)</i></li> </ol>
<b>Continuous technology sensing</b>	



<b>Ability to collaborate with external partners for ideation</b>	<p>7. When scouting for digital technologies (C) Firms should establish a start-up scouting team (I) allowing to extract knowledge from the start-up world (M) to improve its ability to collaborate with external partners for ideation (O)</p> <p>8. When scouting for digital technologies (C) Firms should implement a start-up accelerator (I) to stay up-to date with digital developments (M) to be able to collaborate with external partners for ideation (O)</p> <p>9. When developing digital business models (C), Firms should set up a start-up investment fund (I) to improve its ability to collaborate with external partners (O) by investing in start-ups (M)</p>
<b>Ability to recognize and interpreted value of external environment</b>	<p>10. When in a competitive digital environment (C), firms should conceptualize a business model prototype (I), by quickly solving most pressing business challenges (M) to interpreted value of the external environment (O)</p> <p>11. When operating in a fast- paced digital environment (C), firms should identify technological trends (M), by looking beyond traditional possibilities (M), to be able to interpret value of the external environment.</p>
<b>Experiment and iterative innovation</b>	
<b>Ability to rapidly develop, validate and experiment with business models</b>	<p>12. When operating in a fast- paced digital environment (C) firms need to embed an agile way of working (I) to rapidly develop, validate and experiment with digital business models (O) by working in iterative steps (M)</p> <p>13. When developing digital business models (C) firms should implement the lean start-up methodology (I) to improve a firm’s ability to rapidly develop, validate and experiment with digital business models by constantly testing viability (M)</p> <p>14. When digitally transforming business models(C), firms should implement a prototype platform (I) to quickly develop prototypes (M) to improve a firm’s ability to rapidly develop, validate and experiment with digital business models (O)</p> <p>15. When working in competitive environments (C) firms should establish a digital centre of excellence (I) to rapidly develop, validate and experiment with digital business models (O) by building digital capabilities centrally (M)</p>
<b>Continuous customer integration into the development process</b>	<p>16. In a digital environment (C) firms should engage in design thinking (I) to integrate customers in the development process (O) by driving outside-in thinking (M)</p>
<b>Coordinate and strategic align innovation</b>	

<b>Strategic agility and innovation alignment</b>	<p>17. When digitally innovating business models (C) Firms should align business model innovation with its digital strategy (I) to create a clear ambition and mission (M) to improve the strategic alignment (O)</p> <p>18. When operating in a competitive environment (C), firms should define digital growth areas (I) that serve as guideline for innovation teams (M) to improve a firm's ability to align its digital business model innovation to its strategy (O)</p> <p>19. When digitally innovating business models (C), Firms should define innovation milestones &amp; objectives (I), to help prioritize and measure progress (M) to strategic align digital business model innovation (O)</p>
<b>Ability to balance digital portfolios &amp; strategic investments</b>	<p>20. When operating in a fast- paced digital environment (C) firms should establish an innovation funnel blueprint (I) to deal effectively with uncertainty associated with innovation (M) to be able to balance digital portfolio's and manage strategic investments (O)</p> <p>21. When operating in a decentralized organization (C), firms should establish a central innovation board (I) to balance digital portfolio's and manage strategic investments (O), by focus on long-term with higher risks.</p> <p>22. When developing digital business models (C), firms should define digital innovation metrics (I) by governing digital innovation besides its regular operations (M), to improve a firm's ability to balance digital portfolios and manage strategic investments (O)</p>
<b>Integration capability</b>	
<b>Ability to scale the business model through partnerships and digital ecosystems</b>	<p>23. When operating in a fast- paced digital environment (C), firms should introduce an accelerator for start-ups (I) to improve a firm's ability to scale the business model through partnerships and digital ecosystems (O), by enabling easy collaboration and integration (M)</p> <p>24. When operating in a high-tech digital environment (C), firms should establish a digital platform business (I) to facilitating valuable interaction between producers, suppliers, customers, and organizations (M) to improve a firm's ability to scale the business model through partnerships and digital ecosystems (O),</p>
<b>Enhance internal knowledge exchange and integration</b>	<p>25. When operating in a fast- paced digital environment (C), firms should develop an integrated technology platform (I) by establishing a common view of customers, products, processes, and systems (M) to enhance a firms internal knowledge exchange and integration (O)</p>
<b>Orchestration</b>	

<p><b>Ability to redesign its organizational structure</b></p>	<p>26. <i>When operating in a competitive environment (C) firms should Incorporate outside-in organizational restructuring (I) to overcome internal silo's (M) to improve its ability to redesign and transform organizational structure.</i></p> <p>27. <i>When working in a complex multidimensional organization (C) firms should map its operations with a business activity model (I) to identify non-digital processes (M) to improve its ability to redesign and transform its organizational structure (O)</i></p>
<p><b>Ability to provision and reconfigure key competences</b></p>	<p>28. <i>When operating in a complex digital environment (C), firms should establish a transformation office (I), to select and source business model specific competence (M) to be able to provision and developing digital competences (O)</i></p> <p>29. <i>Particularly in competitive environments (C), firms should implement an intelligence hub (I) to continuously develop and share knowledge throughout the organization (M) to improve its ability to provision and reconfigure digital competences (O).</i></p> <p>30. <i>When operating in a competitive digital environment (C) Firms should coach and collaborate (I) to demonstrate, participate, imitate and self-direct digital insights (M) to improve its ability to provision and reconfigure digital competences (O)</i></p> <p>31. <i>When competing for digital talent (C) firms should implement interactive training programs (I) build skills and competences (M) to improve its ability to provision and reconfigure digital competences</i></p>

## 7 DISCUSSION

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This section contains the theoretical implication to existing literature, the practical implications, the limitations of this research and the recommendations for future research.

### 7.1 THEORETICAL IMPLICATIONS

The presented qualitative study is aimed to examine how organizations build dynamic capabilities for digital business model innovation. As outlined by Teece (2018a), the concepts of business model and dynamic capabilities have been understood on a theoretical level, but empirical insights to connect the two are still lacking. Thus, the purpose of this study was to contribute to the request for more empirical insight in the relationship between business model innovation and dynamic capabilities (Randhawa et al., 2021; Teece, 2018a; Vial, 2019). In this study 12 digitally grounded critical capabilities were identified that are needed for digital business model innovation. Therefore, this study follows the by Warner and Wäger (2019) proposed conceptualization where "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" (p: 37).

First, using a dynamic capability lens, this thesis investigates how firms develop and implement digital business models, as there were significant gaps in understanding the internal drivers of business model innovation (Foss & Saebi, 2017). By focusing on dynamic capabilities as internal antecedent of business model innovation, as proposed by Teece (2018a), this thesis has aimed to elaborate and clarify the relationship between these two constructs. Furthermore, the results of this study confirm the relevance of dynamic capabilities in the business model development process, to proactively respond to digital opportunities and threats (Achtenhagen et al., 2013; Mezger, 2014; Warner & Wäger, 2019; Witschel et al., 2019). This is especially true in highly volatile market environments (Teece, 2012).

Second, this study has further specified the dynamic capabilities of sensing, seizing and reconfiguring by proposing six higher-order dynamic capabilities that facilitate change on the business model level. By using the dynamic capability lens this thesis has established twelve critical capabilities that are essential for the development of digital business models. Although some activities and capabilities that were identified could also be applied to nondigital business model innovation, Velu (2017) state that firms must build a system of dynamic capabilities in order to pursue business model innovation. In contrast to nondigital-based strategic change, this thesis argues that the characteristics of new digital technologies is altering the nature and purpose of innovation processes. In particular, the unbounded innovation outcomes, less predefined innovation agency and the continuous interaction between processes and outcomes means building adequate dynamic capabilities is now a strategic imperative for incumbents to survive in a digital era (Nambisan et al., 2017; Warner & Wäger, 2019). For example, digital technologies allow for more customer interaction and insights which pressures organizations to build dynamic capabilities that help to realize more customer centric business models. Furthermore, especially for digital innovation, this study confirms the strong interaction and iterative nature between sensing and seizing (Mezger,

2014; Teece, 2010; Zahra, 2008), which is mainly covered by innovation departments of the case companies.

Given that all twelve capabilities are of significant importance for digital business model innovation, there are six critical capabilities that need to be addressed in particular. These are (1) the ability to integrate customer into the ideation phase, (2) the ability to rapidly develop, validate and scale business models through continuous and iterative innovation processes, (3) the ability to coordinate and strategic align digital innovation (4) the ability to enhance internal interaction and knowledge exchange (5) the ability to source, evaluate and select new processes, resources, competences and assets (6) the ability to collaborate with external partners for ideation and competence development.

Last, this thesis extends previous dynamic capability research by focusing on the interventions that help to build dynamic capabilities for digital business model innovation. Thereby following the recent call of Schilke et al. (2018) and Vial (2019) for more understanding of the micro processes that contribute to the development of dynamic capabilities. Hereby extending and supporting previous literature that has investigated how building of dynamic capabilities can be realized in practice (Ellström et al., 2021; Fellenstein & Umaganthan, 2019; Warner & Wäger, 2019; Witschel et al., 2019).

## 7.2 PRACTICAL IMPLICATIONS

This capability-based perspective proposes a systematic framework for organizations to engage in digital business model innovation. It suggests that digital business model innovation can be achieved through three distinct capability dimensions which can be aggregated into twelve critical capabilities and accompanied activities. This framework aims to deliver a structural approach that helps to achieve coordination between different innovation processes to develop innovative business models.

Several papers address there are inconsistencies regarding the concept of digital transformation and its accompanied activities (Verhoef et al., 2021; Warner & Wäger, 2019). Therefore, this thesis aims to provide clarity to leaders regarding the innovation activities for digital business model innovation. Recent developments in the field of digital transformation have proposed several digital maturity models that help practitioners to assess organizations on their digital journey (Bonnet & Westerman, 2021; Kane et al., 2017; Teichert, 2019). This study argues that the proposed framework may help to understand how firms can achieve digital maturity by building dynamic capabilities for digital business model innovation.

Foremost, the insights from this study can be used as a checklist for practitioners when aiming to develop capabilities for digital business model innovation. Because successful business model innovation is linked to a variety of organizational activities, the framework can assist managers and strategists in grasping the big picture of this complicated process. To embrace digital innovation, firms must develop the twelve proposed capabilities to be able to identify, develop, and implement digital business models. Through this framework, managers can evaluate their capabilities and prioritize certain activities. Important here is to note that firms must build a system of dynamic capabilities in order to pursue business model innovation. Digital innovation especially requires a strong interaction and iteration between sensing and

seizing. For example, when firms aim to rapidly develop, validate, and experiment with digital business models it is important to have the ability to integrate customers to validate solutions.

Furthermore, the list of design principles offers guidelines for building and implementing dynamic capabilities. Each dynamic capability can be built by several suggested interventions. It is important to note that the appropriate measures for each firm may vary depending on the type of business model and underlying contextual factors.

### 7.3 LIMITATIONS

However, as with all exploratory research, the current study is not without its limitations. A first limitation of this study is related to the transferability of the results to wider research context. It is unclear whether this research model would be applicable to a broader variety of organizations in fast-changing or moderate dynamic environments. This study was primarily focussed on finding similarities between dynamic capabilities in case companies. Therefore, the case selection is focussed on firms that already have implemented several interventions to create value in a digital context. This has led to all case companies being active in the service domain, while purposefully excluding a (manufacturing) company that was in a less advanced phase of digital transformation and was therefore taking limited actions in digital business model innovation. Having a wider variety of case companies can help to find differences between various industries and contexts.

Although performing this study as research intern at a consultancy firm provided access to a wide variety of cases and with several individual perspectives, it could be argued that this could have led to a somewhat one-sided view. This could be improved by adding additional cases to the data, outside the network of the consultant.

Also, although a vast amount of the participants in this study has a strong digital, technological, and innovative affection, they remain primarily business oriented. For example, the majority of the participants see technology and digital as a means to realize your strategy, instead of using digital to enhance a firm's strategic and dynamic capabilities. As participant L has pointed out *'businesspeople like to keep tech and data in a box, because its handy and they don't understand how to talk about it... Whereas digital needs visionary leadership where tech is more interwoven in the organization, and where designers and business people should be one and the same'*. Therefore, it might have provided interesting insights when purposefully more technological oriented participants were included.

### 7.4 FUTURE RESEARCH

To advance this work, several suggestions can be made for future research directions. First, this study has found that the relevance of a firm's dynamic capabilities is largely determined by their competitive landscape and environmental volatility in which a firm operates. Where knowledge-intensive industries like financial are already highly digitalized, while asset-intensive industries like manufacturing are primarily in its footsteps of their digital transformation. Therefore, it would be interesting to research the impact of industry characteristics on the nature of a firm's dynamic capabilities. This can also help to gain a better understanding in the contextual influences and determine which internal firm (firm size, age, board composition) and

external market factors (e.g., competition intensity, products vs. services, technological intensity) may moderate the impact of dynamic capabilities on firm performance (Verhoef et al., 2021). This can also help to indicate till what degree firms should transform digitally.

Moreover, development in digital transformation literature have also proposed the concept of digital maturity (Kane et al., 2017) as capacity to respond to change. Following Vial (2019), dynamic capability literature can help to further understand how firms can effectively achieve digital maturity by further investigating the mechanisms that enable this process. Incorporating the concept of digital maturity can help to determine how effective certain interventions are during different phases of digital transformation (Verhoef et al., 2021). For example, Warner and Wager (2019) propose that organizations in an earlier digital stage focus more on business model renewal, while more digitally advanced organizations efforts are focussed on replacing collaborative approaches and refreshing cultures.

Furthermore, with the increasingly embedded role that IT has in organizations and in the creation of dynamic capabilities, this study provides suggestions to further investigate digitally-driven dynamic capabilities (Chirumalla, 2021; Mikalef & Pateli, 2017; Steininger et al., 2021). For example, the increasing use of data has been indicated to provide value for sensing, seizing and reconfiguring and is mostly enabled through IT applications. Therefore, research can be advanced by further investigating the link of information system research and dynamic capability research.

Lastly, this research is aimed to explore the topic by means of qualitative methods to extract meaning from the business model innovation process. A suggestion would be to proceed with quantitative methods such as surveys to measure the effects of interventions on dynamic capabilities and innovation performances. Additionally, it is recommended to perform a longitudinal study that could study change processes and performances over time. As business model innovation is an ongoing process, a longitude case-study design could provide more advanced insight on effectiveness of interventions, dynamic capabilities, business model innovation, and its impact on organizations within dynamic environments.

## 8 CONCLUSION

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The purpose of this thesis was to facilitate firms in building dynamic capabilities for digital business model innovation. This was done by first conceptualizing business model innovation in a digital context. Next this study has investigated what dynamic capabilities are needed for digital business model innovation. Lastly, this study aims to understand what interventions can be identified that enable firms to build these capabilities.

First, the unique characteristic of digital technology has several implications for the innovation outcome as well as for the innovation process. This especially explains *why* firms need to build particular capabilities and the underlying cause of this change process. All the cases in this paper aim to build strong dynamic capabilities when adapting and innovating their business model in a digital era. Therefore, this study emphasize that firms need to build relevant capabilities to overcome these challenges. In line with previous research this study highlights that firms need to build strong dynamic capabilities to rapidly create, implement, and reconfigure business models to remain relevant in the emergent digital economy.

Second, this study has specified *what* dynamic capabilities are needed for digital business model innovation. This study has first specified six higher-order dynamic capabilities that ought to be relevant for digital business model innovation. These capabilities are subsequently supported by twelve critical capabilities that specify the dimensions of the higher-order dynamic capabilities.

Lastly this study contributes to responding to the request for more empirical research explaining the micro processes that contribute to the development of dynamic capabilities. A list of practice-oriented interventions has been identified that help to build the dynamic capabilities for digital business model innovation. These interventions particularly show *how* a firm can engage in digital business model innovation. Furthermore, these interventions highlight some specific processes and activities are becoming more digitally driven or have emerged with to rise of digital technologies. This offers interesting opportunities for future research in the direction of digitally-driven process innovation, as discussed under 7.4 future research.



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## APPENDIX A: INTERVIEW GUIDE

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### INTRODUCTION:

- The objective of this interview is to understand how incumbent organizations can build dynamic capabilities for digital business model innovation.
  - o Welke capaciteiten (i.e. dynamic capabilities) heeft een bedrijf nodig voor het continue innoveren van haar bedrijfsvoering voor nieuwe (digitale) veranderingen?
  - o Wat voor interventies/methodes zijn er om deze capaciteiten te vergroten?
- I'm interested in your experiences, there is no right or wrong answer.
- The interview will take approximately 60 minutes.
- Are you okay with the interview being recorded, just for the purpose of making notes and transcribing?

Please put yourself in the shoes of a senior innovation manager from an incumbent organization who is responsible for enabling digital business model innovation within their organization. For this research I'm interested to understand what capabilities are needed for digital business model innovation. And what methodologies/activities/interventions/structures an organization can implement to help enhance this capability.

### INTERVIEW QUESTIONS

Overarching Themes	Questions	Possible Follow Up Questions
<b>General Questions</b>	1. Could you give a brief introduction of yourself?  2. How do you see digital transformation changing industry and organizations within the next 5-10 years?  3. How would you determine an organization's ability to initiate changes to its business model?	2a What measures do you think organization should be taking to enable these changes of the business environment?  3a What capabilities do organizations need to digitally transform their business model?
<b>Dynamic Capabilities</b>	<i>Literature argues that dynamic capabilities enable firms to adapt to changes through three mechanisms: (1) sensing opportunities and threats, (2) seizing opportunities, and (3) reconfiguring the organization's underlying resources and assets.</i>	

	<i>Dynamic capabilities differentiate from 'ordinary' capabilities, since they are focused on redirecting ordinary capabilities towards higher-payoff endeavors and the development of new capabilities.</i>	
<b>Sensing</b>	<i>Sensing and shaping for new opportunities is focused on activities such as scanning, creating, learning and interpreting a firms business environment (Teece, 2007). Furthermore, it involves activities such as identifying, developing, co-creating and assessing technical opportunities related to customer needs (Teece, 2014, p. 332).</i>	
<b>Sensing</b>	<p>4. What kind of capabilities do organizations need to sense digital opportunities and threats?</p> <p>5. Can you name activities that help organizations in sensing digital opportunities and threats?</p> <p>6. What methods help organizations to acquire new information about the digital trends and digital customer needs?</p> <p>7. What methods can encourage knowledge sharing about digital topics within the organization?</p> <p>8. How can you encourage external learning activities about digital topics?</p>	<p>4b what role does technology have in sensing opportunities and threats?</p> <p>6a. How can organizations keep abreast of new emerging technologies (IOT, Blockchain etc)?</p>
<b>Seizing</b>	<i>Seizing capabilities are uses to address opportunities and threats that are sensed by developing new products, processes, services or a combination of these (Teece, 2007). Seizing capabilities allows organizations to capture value from potential business opportunities and help to determine what specific adoptions are needed within the organization to seize the value of new opportunities (Yeow et al., 2018)</i>	
<b>Seizing</b>	<p>9. What kind of capabilities do organizations need to seize digital opportunities?</p> <p>10. Can you name activities that help organizations in seize digital opportunities?</p> <p>11. What methods enable organizations to prioritize and balance its digital initiatives?</p>	<p>10a Do you have examples of these activities?</p> <p>10b what role does digital technology have in seizing digital opportunities?</p>

	<p>12. How can you encourage organizations in developing digital ideas into reality?</p> <p>13. What role do external partners have in seizing digital opportunities?</p> <p>14. How can you encourage leadership and effective communication of values for new digital opportunities?</p>	<p>12a What kind of methods could you implement?</p> <p>13a Can you give an example?</p>
<b>Reconfiguring</b>	<p><i>Reconfiguring capabilities are described as the process of transforming organizational structures and assets in response to corporate growth and environmental changes (Teece, 2007). Furthermore, it plays a significant role when organizations want to transform their existing resources to align with new strategies, building new ones, and supplement current resource gaps (Yeow et al., 2018).</i></p>	
<b>Reconfiguring</b>	<p>15. What capabilities are needed in order to digitally transform a firm's resources and assets?</p> <p>16. What methods and activities can help to digitally transform a firm's assets and resources?</p> <p>17. How can you restructure an organization to enable digital transformation of business models?</p> <p>18. Can you describe any governance or incentive structures designed to encourage digital transformation?</p> <p>19. How can organizations continuously match its resources and capabilities with emerging digital opportunities?</p>	<p>16a Do you have examples of these activities?</p> <p>16b what role does digital have in reconfiguring resources?</p> <p>17a. What are initiatives that have helped to disrupt old organizational routines for digital?</p> <p>18a. How can you change internal values and norms for digital?</p> <p>19a. How can you prepare employees for digital change?</p>

# APPENDIX B: SEARCH QUERY SYSTEMATIC LITERATURE REVIEW

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ti(dynamic capabilities OR dynamic capability OR capabilities OR capability) AND ti(digital transformation\* OR digitalization OR digital OR digital business model\* OR digital business model innovation OR digital platform\* OR digital platform innovation)

128 results.

Number of results from query	128	
Number of results after title selections	67 results	
Number of results after abstract selection	50	

## APPENDIX C: RESULTS SYSTEMATIC LITERATURE REVIEW

Critical capabilities	Key activities related to critical capabilities	Source
Continuous business model sensing		
Sense and monitor the external environment	<ul style="list-style-type: none"> <li>• Trend monitoring and market screening,</li> <li>• Exchange with cross-divisional units,</li> <li>• Industry benchmarking,</li> <li>• Participation in market surveys of customers,</li> <li>• Analysis of best practices,</li> <li>• Detailed evaluation of market potential.</li> <li>• screening digital competitors,</li> <li>• sensing customer-centric trends.</li> <li>• Identify new digital opportunities, also outside network of partner firms</li> <li>• SME's should study trends and ways of doing business from bigger competitors.</li> <li>• insights into (new) markets,</li> <li>• (re) positioning the firm's brand,</li> <li>• dealing with new customers or changing customer needs</li> </ul>	Witschel, Döhla, Kaiser, Voigt & Pflertschinger (2019) Warner & Wäger (2019), Yeow, Soh, & Hansen (2018), Teece (2017)
Integrate customers in ideation phase	<ul style="list-style-type: none"> <li>• Co-creation workshops,</li> <li>• feedback sessions with customers,</li> <li>• Ideation phase with lead users,</li> <li>• Voice of the customer program</li> <li>• The adoption of various types of technology, mainly social networks</li> <li>• Empowering customers &amp; establishing connections,</li> <li>• customer and healthcare centric professionals,</li> <li>• Transparency and data interoperability</li> </ul>	Kokshagina (2021), Witschel, Döhla, Kaiser, Voigt & Pflertschinger (2019), Matarazzo, Penco, Profumo & Roberto (2021)
Continuous technology sensing		
Ability to collaborate with external partners for ideation	<ul style="list-style-type: none"> <li>• Research cooperation with external partners,</li> <li>• Building an ecosystem of strategic partners,</li> <li>• Hackathons with external partners,</li> <li>• Cross-industry networking,</li> <li>• Industry networking,</li> <li>• Start-up involvement</li> </ul>	Witschel, Döhla, Kaiser, Voigt & Pflertschinger (2019),
Ability to recognize and interpreted value of external environment	<ul style="list-style-type: none"> <li>• Analysing scouted signals,</li> <li>• interpreting digital future scenarios,</li> <li>• Formulating digital strategies</li> <li>• Specification of value proposition,</li> <li>• Conception of revenue model options,</li> <li>• Conception of the business model prototype,</li> <li>• Cross-industry imitation and adaptation</li> <li>• Routines to evaluate the demand for digital infrastructure and search for new solutions</li> <li>• Environmental Scanning and sensing capabilities in combination with in-depth knowledge of their core products as well as knowledge of the products of complementary asset providers</li> <li>• Collaborative and integrated working environment, continual and fast pace of innovation,</li> <li>• Forecasting and Monitoring of market needs</li> </ul>	Warner & Wäger (2019). Witschel, Döhla, Kaiser, Voigt & Pflertschinger (2019), Helfat & Raubitschek (2018), Yeow, Soh, & Hansen (2018) Ludovica & Francesca (2021), Steininger et al. (2022) Ellström, Holtstrom, & Johansson (2021).
Experiment and iterative innovation		
Ability to rapidly develop, validate and experiment with new business models	<ul style="list-style-type: none"> <li>• Scrum-based agile development,</li> <li>• end-to-end development,</li> <li>• Communities of practices.</li> <li>• Investing in new digital skills and projects, which are supposed to drive change and work on new products &amp; services as well as partnerships to reach untapped markets.</li> <li>• Working with product owners, scrum masters, proof of concepts, minimum viable products and the continuous development of their digital offerings.</li> </ul>	Fellenstein, J., & Umaganthan, A. (2019) Warner & Wäger (2019). Helfat & Raubitschek (2018)

	<ul style="list-style-type: none"> <li>• Flexible sourcing arrangement, building organizational slack and adopting open innovation processes</li> <li>• Rapid prototyping,</li> <li>• creating minimum viable products;</li> <li>• Considering a lean start-up methodology;</li> <li>• Using a digital innovation lab.</li> </ul>	
Continuous customer integration into the development process	<ul style="list-style-type: none"> <li>• Feedback systems for the design of services,</li> <li>• Customer feedback after every iteration cycle,</li> <li>• Piloting and testing services with lead user.</li> <li>• Interaction and co-development with customers and other stakeholders may be relevant activities.</li> <li>• New digital products &amp; services can only be brought forward with large support from stakeholders.</li> </ul>	Witschel, Döhla, Kaiser, Voigt & Pfltschinger (2019). Fellenstein, J., & Umaganthan, A. (2019)
Coordinate and strategic align innovation		
Strategic agility and innovation alignment	<ul style="list-style-type: none"> <li>• Semi-continuous adaptation of increasingly digitalized strategy, aligned with (changing) environment and (flexible) overall business objectives</li> <li>• Rapidly reallocating resources;</li> <li>• Accepting redirection and change;</li> <li>• Pacing strategic responses</li> <li>• Strategic orientation toward digitalization</li> </ul>	Ellström, Holtstrom, & Johansson (2021). Warner & Wäger (2019). Arias-Pérez, José;Velez-Ocampo, Juan;Cepeda-Cardona, Juan (2021)
Ability to balance digital portfolios & strategic investments	<ul style="list-style-type: none"> <li>• Balancing internal and external options;</li> <li>• Scaling up innovative business models;</li> <li>• Setting an appropriate speed of execution</li> <li>• Investments in the development and commercialization activity of new products, processes or services.</li> <li>• Making large and sometimes irreversible strategic investments in tangible and intangible assets.</li> <li>• Investing in new digital assets by focusing on new digital products and services, digital technologies, digital customer interactions, digital tools and digital processes.</li> <li>• Prioritize digitalization projects based on alignment to digital strategy and re-evaluate resource and team member allocation during exploration phases</li> <li>• Routines to determine what to do in-house and what to outsource, based on an understanding of current competence in the firm and the necessity of the competence for the digital strategy.</li> </ul>	Warner & Wäger (2019). Fellenstein, J., & Umaganthan, A. (2019) Ellström, Holtstrom, & Johansson (2021)
Integration capability		
Ability to enhance internal knowledge exchange and integration	<ul style="list-style-type: none"> <li>• Bundling cross-department competences,</li> <li>• Joint development with external partners,</li> <li>• Offshoring of IT development activities,</li> <li>• Outsourcing of IT development activities</li> <li>• the recognition, internalization, and exploitation of internal and external knowledge, given the substantially different knowledge and technologies underlying digital versus nondigital business models.</li> <li>• The capacity for reliable, repeatable communication and coordination activity directed toward the introduction and modification of products; resources and capabilities; business models</li> <li>• Platforms and channels for information bundling,</li> <li>• Special formats for regular exchange,</li> <li>• Cross-sectoral events,</li> <li>• communities and initiatives</li> </ul>	Witschel, Döhla, Kaiser, Voigt & Pfltschinger (2019); Soluk, Miroshnychenko, Kammerlander, De Massis (2021); Helfat & Raubitschek (2018)
Ability to scale the business model through partnerships and digital ecosystems	<ul style="list-style-type: none"> <li>• External partnership,</li> <li>• Technology-based acquisitions,</li> <li>• Digital investments</li> <li>• Joining a digital ecosystem;</li> <li>• Interacting with multiple external partners;</li> <li>• Exploiting new ecosystem capabilities</li> <li>• Integrate digital solutions into unified digital infrastructure</li> <li>• Special IT security measures,</li> </ul>	Helfat & Raubitschek (2018) Ellström, Holtstrom, & Johansson (2021). Warner & Wäger (2019). Witschel, Döhla, Kaiser, Voigt & Pfltschinger (2019) Sousa-Zomer, Neely, Martinez (2020)

	<ul style="list-style-type: none"> <li>• Building a sustainable platform architecture,</li> <li>• Consistent data protection regulation,</li> <li>• Customized design of the user interface, Synchronization of development processes,</li> <li>• Data models and data analysis</li> <li>• External partnership</li> <li>• Technology-based acquisitions,</li> <li>• Digital investments</li> <li>• Cooperation with cross-industry partners,</li> <li>• Integration of partners into the platform</li> <li>• Introduction of an accelerator for start-ups</li> <li>• Data exchange with partners</li> </ul>	
Orchestration capability		
Ability to redesign and reconfigure organizational structure	<ul style="list-style-type: none"> <li>• Operational and investment changes,</li> <li>• IT and change management initiatives, both internally and externally in the form of outsourcing, as well as the formation of new digital roles.</li> <li>• Restructuring norms, values, and business philosophies to influence reconfiguring organizational operations,</li> <li>• open and transparent norms and value attributes, followed by less authoritative management may promote flexibility to pursue individual change initiatives.</li> <li>• Acquisitions and strategic investments,</li> <li>• Building data analytics competences,</li> <li>• Implementation of an internal restructuring,</li> <li>• Scaling in separate unit,</li> <li>• (Re)integration in existing structures,</li> <li>• Fundamental renewal of the IT organization.</li> <li>• Adopting Loosely coupled structures,</li> <li>• Embracing Open innovation,</li> <li>• Developing Integration and coordination Skills</li> <li>• Hiring a chief digital officer,</li> <li>• Digitalization of business models,</li> <li>• Designing team-based structures</li> <li>• Nimble and agile structure</li> <li>• Multi-divisional structure</li> <li>• Risk-taking culture</li> </ul>	Fellenstein, J., & Umaganthan, A. (2019); Witschel, Döhla, Kaiser, Voigt & Pflertschinger (2019) Teece (2007); Warner & Wäger (2019). Sousa-Zomer, Neely, Martinez (2020)
Ability to provision and reconfigure key competences	<ul style="list-style-type: none"> <li>• Identifying digital workforce maturity,</li> <li>• External recruiting of digital natives,</li> <li>• Leveraging digital knowledge inside firm</li> <li>• Digital savvy officers,</li> <li>• digital savvy directors,</li> <li>• digital savvy workforce</li> <li>• Internal competence development,</li> <li>• Promotion of interdisciplinary IT teams,</li> <li>• Trainee program for digital solutions,</li> <li>• Realignment of recruiting</li> <li>• Any initiatives that help improve and cultivate internal skill-sets as well as increasing the individual's and organization's performance.</li> <li>• self- learning via the web,</li> <li>• online training sessions,</li> <li>• workshops,</li> <li>• implementation of dedicated learning platform</li> <li>• function-specific trainings</li> </ul>	Warner & Wäger (2019). Sousa-Zomer, Neely, Martinez (2020) Witschel, Döhla, Kaiser, Voigt & Pflertschinger (2019) Fellenstein, J., & Umaganthan, A. (2019)



## APPENDIX D: INTERVENTIONS PER CASE

Critical capabilities	Consultant1	Financial1	Financial2	Recruitment1	Engineering1
<b>Business model sensing</b>					
Ability to sense and monitor the external environment	<ul style="list-style-type: none"> <li>Gartners Magic Quadrants,</li> <li>Industry benchmarking</li> </ul>				
Ability to integration of customers into the ideation phase	<ul style="list-style-type: none"> <li>Sparkler,</li> <li>Data analytics</li> </ul>		<ul style="list-style-type: none"> <li>Data &amp; analytics</li> </ul>	<ul style="list-style-type: none"> <li>Data driven CX &amp; UX</li> <li>Data driven decision making</li> </ul>	
<b>Technology sensing</b>					
Ability to collaborate with external partners for ideation	<ul style="list-style-type: none"> <li>Startup fund,</li> <li>Startup accelerator</li> </ul>	<ul style="list-style-type: none"> <li>Inorganic machinery</li> </ul>	<ul style="list-style-type: none"> <li>Partnering &amp; Venturing: Provide analytics, scouting, execution and portfolio management</li> <li>Earlier make buy/build/partner decisions</li> </ul>	<ul style="list-style-type: none"> <li>Innovation fund</li> </ul>	<ul style="list-style-type: none"> <li>Create partnership strategy and network</li> </ul>
Ability to recognize and interpreted value of external environment	<ul style="list-style-type: none"> <li>Dedicated scouting structure,</li> <li>Darkmatter,</li> <li>Art of the possibility pressure cooker</li> </ul>				
<b>Experiment and iterative innovation</b>					
Ability to rapidly develop, validate and experiment with new business models	<ul style="list-style-type: none"> <li>Agile working mode,</li> <li>Lean-startup methodology,</li> <li>Prototype platform</li> <li>Center of Excellence</li> </ul>	<ul style="list-style-type: none"> <li>Agile,</li> <li>Lean startup</li> </ul>	<ul style="list-style-type: none"> <li>Digital Center of Excellence: Acceleration, Open Innovation, MVP lab</li> </ul>	<ul style="list-style-type: none"> <li>Business accelerators</li> <li>Growth hacking toolbox</li> <li>Digital Center of Excellence</li> </ul>	<ul style="list-style-type: none"> <li>Develop a scaling and commercialization engine</li> <li>Digital center of excellence</li> </ul>
Continuous customer integration into the development process	<ul style="list-style-type: none"> <li>Design thinking</li> </ul>	<ul style="list-style-type: none"> <li>Design thinking</li> </ul>		<ul style="list-style-type: none"> <li>Epic &amp; User story template</li> <li>Design toolbox</li> </ul>	
<b>Coordinate and strategic align innovation</b>					
Strategic agility and innovation alignment	<ul style="list-style-type: none"> <li>Develop innovation strategy,</li> <li>Define growth areas,</li> <li>Define innovation milestones,</li> <li>Wargaming,</li> </ul>	<ul style="list-style-type: none"> <li>Align and embed innovation strategy</li> </ul>	<ul style="list-style-type: none"> <li>Align innovation to mission &amp; strategic objective; standardized reporting tool</li> </ul>	<ul style="list-style-type: none"> <li>War gaming</li> </ul>	

<b>Ability to balance digital portfolios &amp; strategic investments</b>	<ul style="list-style-type: none"> <li>Innovation funnel blueprint,</li> <li>Digital portfolio management</li> <li>Innovation governance and metrics,</li> <li>Agile stage gate</li> </ul>	<ul style="list-style-type: none"> <li>Innovation account metrics,</li> <li>Innovation venture fund,</li> <li>Scaling Portfolio,</li> <li>Balance innovation portfolio,</li> <li>Innovation Governance,</li> <li>Stage-gate blueprint</li> </ul>	<ul style="list-style-type: none"> <li>Central governance &amp; strategic innovation agenda</li> <li>Allocate and balance resources cross-BU</li> <li>H1 is in Business Lines; H2 is centrally supported and locally executed; H3 centrally supported and executed;</li> <li>Innovation Board allocates innovation budget,</li> <li>Venture Boards execute stage-gates and release budget;</li> <li>Set strategic funding criteria and 'VC-like funding rounds'</li> </ul>	<ul style="list-style-type: none"> <li>Scaled Agile Framework</li> <li>Innovation funnel blueprint</li> <li>Digital Reality Investment Survey</li> <li>Digital Portfolio Management</li> <li>Benefits Tracker</li> </ul>	<ul style="list-style-type: none"> <li>Apply scaling framework</li> </ul>
<b>Integration capability</b>					
<b>Ability to enhance internal knowledge exchange and integration</b>	<ul style="list-style-type: none"> <li>Define IT foundation,</li> <li>Define solution architecture,</li> <li>Establish digital enterprise platform</li> <li>Digital factory</li> </ul>		<ul style="list-style-type: none"> <li>TechLab: scalable IT to accelerate innovation</li> <li>Centrally shared innovation experts, and innovation capabilities to accelerate the innovation speed</li> <li>Data &amp; Analytics</li> </ul>	<ul style="list-style-type: none"> <li>Integrated technology platform incorporating CX, Data, API integration, CRM, and HR white label platform</li> <li>Internal collaboration platform</li> </ul>	<ul style="list-style-type: none"> <li>Develop a cross-market / cross-client IoT platform strategy</li> <li>Digital Center of Excellence</li> </ul>
<b>Ability to scale the business model through partnerships and digital ecosystems</b>	<ul style="list-style-type: none"> <li>Startup fund</li> <li>Startup accelerator</li> </ul>	<ul style="list-style-type: none"> <li>Inorganic machinery</li> </ul>	<ul style="list-style-type: none"> <li>Partnering &amp; Venturing</li> </ul>	<ul style="list-style-type: none"> <li>Innovation fund</li> </ul>	<ul style="list-style-type: none"> <li>Create partnership strategy and network</li> </ul>
<b>Orchestration capability</b>					
<b>Ability to redesign its organizational structure</b>	<ul style="list-style-type: none"> <li>Business activity model</li> </ul>			<ul style="list-style-type: none"> <li>Digital Hub and Spoke Model</li> </ul>	<ul style="list-style-type: none"> <li>Develop digital consultancy capability</li> <li>Hub &amp; Spoke model</li> </ul>
<b>Ability to provision and reconfigure key competences</b>	<ul style="list-style-type: none"> <li>Digital maturity assessment</li> <li>Intelligence hub,</li> <li>Learning by doing</li> <li>Interactive training programs</li> </ul>	HR approach		<ul style="list-style-type: none"> <li>Build on exiting digital staff</li> <li>End-to-end experience</li> <li>Data as key enabler</li> </ul>	