The Fuzzy Front End of Digital Transformation:
Activities and Approaches for Initiating Organizational Change Strategies

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Sabine Berghaus

from

Germany

Approved on the application of

Prof. Dr. Andrea Back

and

Prof. Dr. Sven Reinecke

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Abstract

Digital transformation is critical to the survival of businesses and provides a range of new opportunities. However, initiating any effective organizational transformation is a complex and non-routine managerial task. Mangers are often aware of the external environment changing, but many are unable to act upon it. Evidence from product innovation has shown that the initiation phase has great impact on the outcome of the process but at the same time, the initial stages of digital transformation strategy formation are less considered in research. This dissertation contributes to filling this research gap by providing more clarity about the first phase of digital transformation as well as methodological structure for initiating a successful digital transformation program. The fuzzy front end is a well-established concept of the product innovation domain. However, it has not been applied to innovation processes in other disciplines yet. In this thesis, I introduce the fuzzy front end as a new perspective on organizational transformation processes and explore how activities related to experimentation, analysis, and collaboration in the fuzzy front end of digital transformation contribute to the formation of organizational change strategies. This cumulative dissertation contains an introductory paper, introducing the topic, presenting the theory, and discussing the findings. The five research contributions of this thesis consist of an introductory literature review exploring the prior research on strategy formation in different domains, a description of a typical case of exploration innovative technology, the design of a digital maturity model, the derivation of digital transformation stages based on a survey among 547 participants, and finally, the delineation of typical activity systems and approaches from eleven case examples.

The results of this dissertation provide a detailed description of the fuzzy front end of digital transformation and contribute to the understanding of the initial phase of radical and disruptive organizational changes by applying a knowledge generated in the product innovation domain to a new discipline. Managers benefit from a deeper understanding of the digital transformation process and also make use of concrete instruments that help them to plan and structure their strategic change process.

Zusammenfassung

Die digitale Transformation ist entscheidend für den Fortbestand von Unternehmen und eröffnet eine Reihe an neuen Möglichkeiten. Allerdings ist die Einleitung eines jeden Transformationsprozesses eine komplexe und nicht alltägliche Aufgabe für Manager. Diesen ist häufig bewusst, dass sich das äussere Umfeld ändert, aber viele sind nicht in der Lage entsprechend zu handeln. Ergebnisse aus dem Bereich Produktinnovation zeigen, dass die Anfangsphase einen grossen Einfluss auf den Erfolg des Innovationsprozesses hat, aber der Beginn der Bildung einer digitalen Transformationsstrategie momentan in der Forschung nur wenig Beachtung findet. Diese Dissertation trägt dazu bei, diese Forschungslücke zu schliessen, indem ein klares Bild der Anfangsphase in der digitalen Transformation und methodische Anhaltspunkte für das erfolgreiche Aufsetzen eines Transformationsprogramms erstellt werden. Das Fuzzy Front End (FFE) ist ein gut erforschtes Konzept aus der Produktinnovation, das allerdings noch nicht auf Innovationsprozesse in anderen Disziplinen übertragen wurde. In dieser Dissertation wird das FFE als neue Perspektive auf organisationale Transformationsprozesse angewendet. Es wird untersucht, wie das Experimentieren, Analysieren und Kollaborieren in der Anfangsphase der digitalen Transformation zur Entstehung einer Strategie zum Organisationswandel beiträgt. Diese kumulative Dissertation besteht aus einem einleitenden Beitrag, der das Thema und die theoretischen Grundlagen vorstellt sowie die Ergebnisse diskutiert. Die fünf Publikationen bestehen aus einer einleitenden Literaturschau, welche den Stand der bisherigen Forschung im Bereich Strategiebildung in verschiedenen Disziplinen untersucht; die Beschreibung einer typischen Phase des Experimentierens mit innovativer Technologie; die Gestaltung eines digitalen Reifegradmodells; die Herleitung von Entwicklungsstufen in der digitalen Transformation aus einer Befragung von 547 Teilnehmenden; sowie der Beschreibung von typischen Aktivitäten und Herangehensweisen anhand von elf Fallbeispielen.

Die Ergebnisse dieser Dissertation führen zu einer detaillierten Beschreibung der FFE-Phase in der digitalen Transformation und tragen zur Erklärung der Anfangsphase von tiefgreifendem organisationalen Wandel bei, indem vorhandenes Wissen aus der Produktinnovation in einem neuen Bereich angewendet wird. Entscheidungsträger erhalten neben dem besseren Verständnis des digitalen Transformationsprozesses konkrete Instrumente, um strategische Veränderungsprozesse zu planen und zu strukturieren.

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Abbreviations

CDO	Chief Digital Officer
CEO	Chief Executive Officer
CIO	Chief Information Officer
DBS	Digital Business Strategy
DMM	Digital Maturity Model
DT	Digital Transformation
FFE	Fuzzy Front End
ICIS	International Conference on Information Systems
IS	Information Systems
IT	Information Technology
HICSS	Hawaii International Conference on System Sciences
HR	Human Resources
MCIS	Mediterranean Conference on Information Systems
PE	Punctuated Equilibrium
RBV	Resource based view
RQ	Research Question
TOE	Technology, Organization, Environment
VHB	Verband der Hochschullehrer für Betriebswirtschaft

Contributions

Contribution A

Berghaus, S. (2016). The Fuzzy Front-End of Digital Transformation: Three Perspectives on the Formulation of Organizational Change Strategies. In Bled 2016 Proceedings (pp. 129–144).

Contribution B

Berghaus, S., & Back, A. (2015). Requirements Elicitation and Utilization Scenarios for In-Car Use of Wearable Devices. In 48th Hawaii International Conference on System Sciences (pp. 1028–1037). *(Nominated for Best Paper Award)*

Contribution C

Berghaus, S., & Back, A. (2016). Gestaltungsbereiche der Digitalen Transformation von Unternehmen: Entwicklung eines Reifegradmodells. Die Unternehmung. Swiss Journal for Business Research and Practice, 70(2), 98–123.

Contribution D

Berghaus, S., & Back, A. (2016). Stages in Digital Business Transformation: Results of an Empirical Maturity Study. Tenth Mediterranean Conference on Information Systems (MCIS) Proceedings. Paper 22.

Contribution E

Berghaus, S., & Back, A. (2017). Disentangling the Fuzzy Front-End of Digital Transformation. Activities and Approaches. Accepted for publication in the proceedings of the International Conference on Information Systems (ICIS).

I. Part 1

"The key to longevity – and immortality, in a sense – has to do with transformation."

Marilyn Manson

1 Introduction

Transformation is critical to the survival of businesses (Andal-Ancion, Cartwright, & Yip, 2003; Lucas & Goh, 2009). Transformation allows businesses to expand, tap into new markets, and gain competitive advantage by adapting to changing conditions. Consequently, companies with strong transformation capabilities outperform companies without such dynamic capabilities (Karimi & Walter, 2015; Klarner & Raisch, 2013). The necessity of transformation is usually driven by societal, industrial, or technological advancement. Previous phases of such advancement, for instance industrialization (Cameron, 1985) or globalization (Caliskan & Isik, 2016) lead to the perishing of those businesses that could not transform to meet the new requirements of survival. The businesses that failed were eventually replaced by those that would then go on to write the new rules of business and management in a changed market context. In recent decades, the so-called "digital transformation" has emerged as a fourth industrial revolution. The digital transformation of businesses is driven by societal, consumerist, and managerial changes in a global, informed, highly-connected, and interdependent economy (Castells, 2000; Kenney, Rouvinen, & Zysman, 2015).

The digital transformation provides a range of new opportunities for businesses. It allows for automation of existing processes and thus increasing efficiency in production as well as increased organizational agility (Sambamurthy, Bharadwaj, & Grover, 2003). Widespread generation, trade, and use of data as a rediscovered key resource of businesses help automate and improve operations (Huang, Henfridsson, Liu, & Newell, 2017). The digital transformation enables businesses to drive innovation and improve existing product and service offers with new or complementary digital services (Hanelt, Piccinini, Gregory, Hildebrandt, & Kolbe, 2015; Porter & Heppelmann, 2014). The capability to develop substantially innovative offers, in turn, provides companies with the opportunity to reinvigorate their business model (Bleicher & Stanley, 2016). More specifically, the digital transformation provides opportunities to integrate new touch points with consumers and businesses engaging in more valuable interactions in terms of experiential immersion, involvement, and potential for customer insight (R. Hansen & Sia, 2015).

Digitization is not a new challenge, but its impact on human behavior, markets, and organizations has become particularly apparent only in recent years. The rapid advancement of digital technologies as well as the increasing ubiquity of digital technologies generated a challenge that organizations need to face in order to stay successful in the digital age (Berman, 2012; Resca & Spagnoletti, 2014). Therefore, organizations now

increasingly invest resources into their transformation processes to comply with the new requirements of the digital age and reap the potential benefits of staying relevant and competitive (Ross et al., 2016; Weill & Woerner, 2015).

However, initiating any effective organizational transformation program is a complex, ambiguous, ill-defined, and non-routine managerial task. When embarking on a transformation journey, the intended target is in most cases rather vague and obscure (Grady, Magda, & Grady, 2011). Managers are often aware of the external environment changing but they do not take action (Bettis & Prahalad, 1995) as digital transformation requires to challenge and even break the dominant logic of an organization's strategic process, its beliefs, assumptions, and mental models (Prahalad & Bettis, 1986).

Furthermore, multiple aspects make the initial steps of a digital transformation process particularly difficult for managers. First, since digital technology is constantly changing and developing dynamically, it is difficult to apply the established strategic planning and innovation management processes since digitization calls for a more dynamic, evolving process (Malik, 2015; Nambisan, Lyytinen, Majchrzak, & Michael Song, 2017). Second, since the impact of digital transformation affects multiple business units, departmental responsibilities and involvements (of, e.g., IT, strategy, marketing, sales, or HR) in the decision process are unclear (Kohli & Johnson, 2011). Third, as technology traditionally assumes the role of an infrastructural commodity, specific knowledge on digital technology is often rare in management departments of most companies. In addition to that, the IT department has not advanced to become a strategic partner who takes over a proactive part in strategy formation (Urbach & Ahlemann, 2017). Fourth, digital transformation requires connected thinking and re-combination of different skills – two capabilities commonly at odds with the traditional departmentalization, which proved efficient in the past but also hinders information flow and collaboration (Holotiuk & Beimborn, 2017).

Evidence from product innovation has shown that the initiation phase has great impact on the outcome of the process (R. G. Cooper, 1988), but at the same time, it is the least well-understood phase (R. G. Cooper & Kleinschmidt, 1986; Dwyer & Mellor, 1991). In digital transformation, we also know very little how digital transformation strategies are initiated (Matt, Hess, & Benlian, 2015) due to the uncertainty managers have to deal with (D. Teece, Peteraf, & Leih, 2016). Other than in much of the strategic planning literature, it is less about executing the planning process in the right way, but selecting the right vision, strategy, and path for the organization, and in that sense take more an entrepreneurial strategy (Drucker, 1985; Gioia & Chittipeddi, 1991).

This dissertation contributes to filling this research gap by providing more clarity about the initial phase of digital transformation processes as well as methodological structure for initiating a successful digital transformation program. In order to improve the understanding of digital transformation, I am drawing from a previously established concept from product innovation literature, the fuzzy front end (FFE), as a new perspective to describe the organizational transformation process. The FFE describes the initial chaotic, ambiguous, and ill-defined stages of an innovation process (Khurana & Rosenthal, 1997; Reinertsen, 1999; Rhea, 2003), until the concept and a strategic plan have been developed and are ready for implementation, e.g. through a stage-gate-process (R. G. Cooper, 2008). Both experience and previous studies show that the better a project is set-up and organized in the beginning, the smoother the process implementation runs and the better the result of the project (R. G. Cooper, 1988). A number of research projects are directed towards the question how the "fuzziness" of the FFE can be reduced in order to minimize risk for the entire project (Gordon, Tarafdar, Cook, Maksimoski, & Rogowitz, 2008; Reinertsen, 1999). My research builds on the proposition that a better understanding and operationalization of the initial stage of the digital transformation process can contribute to a better grasp of how to initiate organizational change strategies – especially as digital transformation does not prompt for a single, but continuous and overlapping organizational transformation activities.

The FFE is a well-established concept of the product innovation domain. However, it has not been applied to innovation processes in other disciplines yet. Organizational change as overarching research field for digital transformation is of great interest in various academic disciplines, among them strategy & management, organization science, entrepreneurship, and information systems. In strategy and management, the research focus is on the role of the top executives of a company (e.g. Kiss and Barr 2015; Zmud 1984). In digital transformation, however, it is often employees and managers of different hierarchies that contribute and drive the process of transformation (Rerup & Feldman, 2011). In organization science, researchers are dealing with the workforces' perspective on change and organizational learning, once the change is already being implemented (M. C. Becker & Zirpoli, 2008; Waldman & Javidan, 2009). In entrepreneurship research, the focus is on creating and implementing digital innovation, while the impact of innovation on established companies is less of a concern (Huang et al., 2017). Lastly, in information systems, the implementation of technology-enabled changes is of great interest (Besson & Rowe, 2012).

Based on the challenges and the theoretical frame, this dissertation on initiating digital transformation strategies intends to bridge the gaps between the aforementioned disciplines and contribute to our understanding of the initial stages of defining an organizational change strategy in an IT-enabled business transformation. This dissertation develops the perspective of the FFE of digital transformation by defining the characteristics and challenges of this first phase of strategy formation in organizational change. Moreover, it develops a deeper understanding of different activities within the FFE – experimentation, analysis, and strategy formation – and delineates concrete instruments and approaches for digital transformation managers.

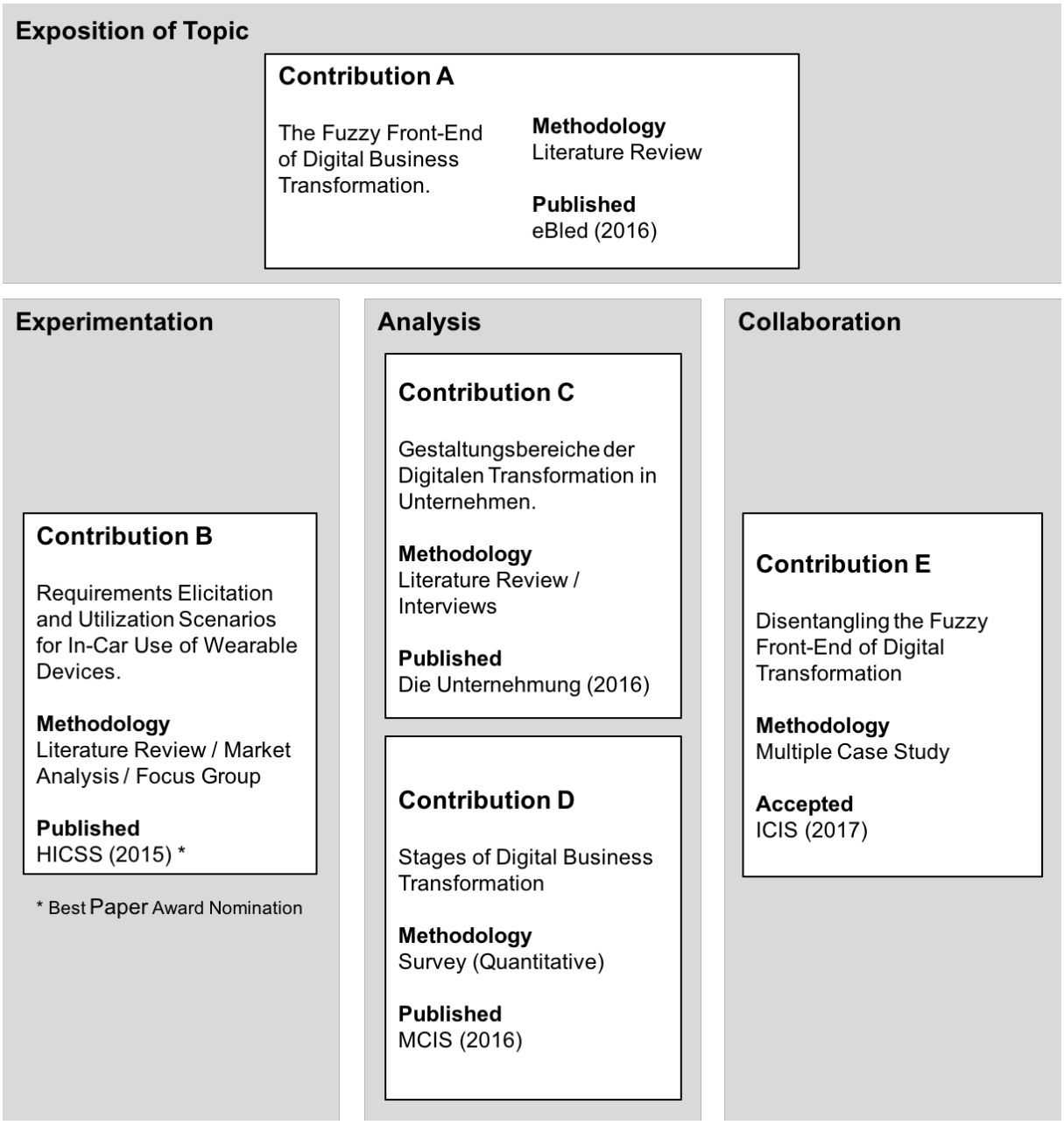

Figure 1: Overview of contributions

This cumulative dissertation comprises of two parts: Part 1 provides an overview of the entire dissertation while Part 2 contains the five research papers. The layout of the single publications has been unified into a common format and all references are consolidated in a common table of references. In the first part, I introduce the general problem statement and motivation for this dissertation in chapter 1. In chapter 2, I define important concepts for this dissertation as well as give an overview on the theoretical background. In chapter 3, I present the research design, while in chapter 4, I briefly summarize the overall findings of the five research contributions, followed by a discussion of the results in chapter 5. In the conclusion in chapter 6, I demonstrate the practical and theoretical contributions of this research, followed by an outlook on further research opportunities. The second part (II) of this dissertation presents the five research papers that are addressing the different aspects of the overarching research question. All papers have been published or are accepted for publication at international peer-reviewed IS conferences (contributions A, B, D, E) and in one management journal (contribution C).

The results of this dissertation provide a detailed, systematic description of the FFE of digital transformation. This contributes to the understanding of the initial phase of radical and disruptive organizational changes. Second, the results apply knowledge generated in the product innovation domain to a new discipline and therefore contribute to the theoretical body of knowledge by adding this new perspective. Third, managers benefit from a deeper understanding of the digital transformation process and also make use of concrete instruments that help them to plan and structure their strategic change process.

2 Theory

Digital transformation is a diverse field and of great research interest in various disciplines. It is a type of organizational change, which is a frequent topic not only in IS research, but also in management, strategy, and organization science research. Therefore, prior research on the formation of organizational change strategy as well as research dedicated specifically to digital transformation provide useful aspects and explanations that the work of this thesis can draw on. This chapter also introduces key findings of prior research on the fuzzy front end (FFE) in the new product development domain, since the thesis uses this concept as lens to research specific challenges of the FFE.

2.1 Organizational Change Strategies

Change is natural to organizations and is experienced in different forms. On the one hand organizational change can be triggered and accelerated by external factors, such as the technological development or a changing market environment (Palmer, Dunford, & Akin, 1957), on the other hand, organizational change can be initiated from within the organization, such as internal reorganizations to increase productivity. The change process is often intended, strategically planned, and managed, however, it also comes unintended and emerges while the organization moves forward (Balogun & Johnson, 2005). Organizational change might refer to small adjustments to processes, structures, or technology, but also to transformational changes that "fundamentally alters the organization at its core" (Palmer et al., 1957) and is a metamorphosis instead of an adaptation (Meyer, Brooks, & Goes, 1990). The term transformation highlights the complexity, scope, and impact of such a fundamental change. In this dissertation, the interest lays on organizational change, which is a transformative rather than a smaller adjustment, and mainly on change initiatives that are planned through a strategic plan as opposed to emergent change. In the following paragraphs, I provide an overview of the most important facets within prior research on organizational change strategies that are of central relevance for this thesis.

First, researchers use various different and even opposing perspectives through which the nature of organizational change can be explained. According to the punctuated equilibrium (PE) model of organizational transformation, short periods of major, radical, and discontinuous change (revolutionary periods) alternate with longer phases of stability (equilibrium periods) and little to no change (Romanelli & Tushman, 1994). This

idea corresponds to Kurt Lewin's often cited three stage model of change that consists of the phases "un-freeze", "change", and "re-freeze" (Lewin, 1963). Also, in a case study over the course of 60 years the existence of cycles of alternating sprints and pauses was detected (Mintzberg & Waters, 1982). All of these publications implicitly imply that organizations strive towards a state of stability, structure, and equilibrium, and organizational change is perceived as a phase of interruption, turbulence, and disruption. The opposite idea is organizational change being perceived as continuous change. Successful organizations mastering continuous change keep structure on the one hand, but allow for experimentation and improvisation at the same time (Brown & Eisenhardt, 1997).

Second, the consequences of organizational change may vary depending on the impact of organizational change. Incremental and radical innovation require different structure, strategy, and procedures for incorporating this change in the organization (Ettlie, Bridges, & O'Keefe, 1984). Following the idea of continuous change, incorporating change is perceived as a natural element to the manager's tendency of seeking structure and planning. Therefore, change is not necessarily occurring in a deliberate fashion and disrupting regular operations, but is initiated more subtly by small changes, experiments, and unintended consequences carried out in organizational work routines that although being minimal, may have a significant impact on the organization (Orlikowski, 1996). Furthermore, change is often perceived as radical or disruptive to the organization and results in a state that is significantly different to the original state. This idea is more often found in information systems research (Lyytinen & Rose, 2003) where organizational change is induced by external, technological innovations rather than a planned process initiated by the management.

Third, with organizational change arises the challenge for employees as well as strategic decision makers to interpret, explain, and construct a narrative about the new, unknown, unexpected and fuzzy situation, which is the process of sensemaking and sensegiving. Manager's may form new ideas about potential opportunities either from the environment or from their own knowledge (Shepherd, McMullen, & Ocasio, 2017). Sensing possible entrepreneurial opportunities is also referred to as entrepreneurial alertness which is found to have a direct effect on strategic change decisions (Roundy, Harrison, Khavul, Pérez-Nordtvedt, & McGee, 2017). When observing the process of sensemaking, the external, organizational and social context needs to be taken into consideration as well, since they are fundamental elements of the process (Weick, 1995). The phases during the initiation of strategic change – which one research project by

Gioia and Chittipeddi identified as envisioning, signaling, re-visioning, and energizing – coincide with alternating cycles of sensemaking and sensegiving, corresponding to understanding and taking action (Gioia & Chittipeddi, 1991). The narrative that communicates the initiation of strategic change has an important impact on the outcome of the change project, however, sensemaking and sensegiving might also lead to different interpretations of a strategic change within the management team or even different sets of narratives for the organization-wide change and local sets of activities (Balogun, Bartunek, & Do, 2015). Sandberg & Tsoukas point out, however, that the sensemaking perspective is primarily taking a retrospective rather than a prospective approach (Sandberg & Tsoukas, 2015), which would be a useful perspective when studying the initiation of an organizational transformation.

Fourth, within the definition of organizational change strategies, the initial process of strategy formation is less researched than other phases. An exception is Mintzberg et al.'s well-known work on strategy formation, in which they describe ten different aspects of strategy formation. This work shows that strategy formation may not only be the visionary or cognitive process of a single leader, but also the result of a negotiation or emerging from a learning process of the entire organization (Mintzberg, Ahlstrand, & Lampel, 1998). In another work, Mintzberg elaborates that one of the reasons why intended strategy may not be realized while unintended strategies emerge is due to the cyclic nature of a long-term transformation, where the original intention cannot remain a strategic priority and there are natural gaps between strategic reorientation and the striving for stability (Mintzberg & Waters, 1982). What makes strategy formation particularly difficult is that certain occurrences cannot be foreseen and strategy, especially for large-scale transformations, needs to deal with uncertainties (J.-L. Denis, Cazale, & Langley, 1996) and emerges from various activities of different sub-systems, which may differ from the original deliberate strategy (Henfridsson & Lind, 2014). Therefore, in ambiguous environments, such as digital transformation, some managers prefer an entrepreneurial approach that builds upon the idea that, if the future cannot be predicted, they rather take action as well as a certain risk (Hoskisson, Chirico, Zyung, & Gambeta, 2017), focus on short-term oriented action, and adjust their actions to the circumstances. This is more of an adaptive and control-oriented than a predictive approach (Grichnik, Baierl, & Faschingbauer, 2016; Wiltbank, Dew, Read, & Sarasvathy, 2006). This idea of taking action and creating the future than predicting it is referred to as effectuation.

Fifth, when planning and managing organizational change, a central but rarely mentioned building block are organizational structures and routines. While strategic change

is often planned on a higher level with a greater strategic vision in mind, the organization changes through concrete activities and procedures in the everyday routines. This is where certain planned and unplanned events and behaviors have the potential for creating innovation (Ciborra & Lanzara, 1994) as well as enacting the organizational change vision (Rerup & Feldman, 2011). Organizational change means disrupting these habits and encouraging employees to adopt new technologies as well as routines (Polites & Karahanna, 2013). Organizational arrangements, but also the social or political environment, core values and beliefs, control systems, as well as the distribution of power constitute an organization's deep structure, which needs to be changed in a strategic reconfiguration (Silva & Hirschheim, 2007). This organizational learning process is not orchestrated, but rather facilitated through trial-and-error processes in taking up new organizational routines (Rerup & Feldman, 2011) or – as Orlikowski frames it – an "ongoing improvisation enacted by organizational stakeholders trying to make sense of and act coherently in the world" (Orlikowski, 1996, p. 65). On the other hand, the adjustment of organizational routines may also serve as a "shock absorber" and facilitate stability and control in organizational transformation (Berente, Lyytinen, Yoo, King, & Berente, 2016).

Summarizing this prior research on organizational change, it becomes clear that only rarely do organizations experience a state of relative stability, even though there is a natural tendency towards it. Phases of fast and disruptive transformations alternate with phases of rather continuous incremental change. When entering a phase of profound and transformational change, the key task for executives in strategy formation is to identify the right moment to initiate change. This sensemaking process involves collecting external signals, interpreting them, and creating a precise idea about the direction the organization should proceed. While some managers act cautious and adapt approaches that have proven viable, others take an effectual and entrepreneurial approach. Creating a strategic vision for the future of the organization is important, however, it must not be forgotten how this affects the organizational routines, since these activities actually enact the strategic vision.

2.2 Digital Transformation

The term "digital transformation" has reached high popularity among managers, consultants, and also researchers in the last couple of years. First, it is necessary to distinguish between digitization and digitalization: With digitization we mean the substitution of an analog artifact with a digital equivalent, while digitalization goes a step further

and refers to the utilization of digital technologies in order to create value or change a business model. In that sense, the latter can be seen as a synonym to "digital transformation". First, digital transformation is an organizational change that is induced by technological advancements. In IS, a considerable body of research has been conducted on IT-enabled organizational change (Cha & Lee, 2013), however, these publications focused to a greater extent on topics such as the impact of IT capabilities on firm performance (e.g. Chae et al. 2014), or strategic alignment of IT and business (e.g. Kearns and Sabherwal 2007), and did not consider other topics as much, such as product innovation or the cultural transformation of the organization beyond the IS-implementation, an exception being for example Silva and Hirschheim (2007). Second, digital transformation is often seen as a profound and fundamental change that affects multiple business units within the organization, e.g. product innovation, strategy, as well as cultural and leadership aspects (Tosey & Robinson, 2002). Third, digital transformation can be used both to describe changes on industry level as well as organizational level ("digital business transformation"). In this thesis, unless otherwise indicated I use the term digital transformation when referring to organizational transformation. Below, I am going to give an overview of the most important facets within prior research on digital transformation that are of central relevance for this thesis.

First, digital transformation of businesses cannot be investigated without taking the effects of the network society into account, which change how organizations communicate with the digital consumers. The network society is a term to describe, explain, and define the changes of society in the new global, informed, and networked economy (Castells, 2000; Clegg, Josserand, Mehra, & Pitsis, 2016). This idea goes beyond mere technological changes, but it includes transformation not only on a societal, but on a political and economic level as well. For the discipline of information systems, this means that the research focus needs to shift away from the IS artifact towards the needs, requirements, and behaviors of the digital user (Brenner et al., 2014). The digital user is not only affecting organizations as consumer, but also in her role as employee. An important driver of digital business transformation is the consumerization of IT (Harris, Ives, & Junglas, 2012), where consumer devices are increasingly used in an enterprise context and, therefore, developments in consumer IT have a growing influence on the advancements in enterprise IT. New digital technologies, such as analytic frameworks or machine learning are increasingly fulfilling more cognitive tasks that traditionally have been part of the knowledge worker's job (Loebbecke & Picot, 2015). While digitization in a sense of process automation primarily affected manufacturing workers, now,

other job profiles are more deeply impacted through digital technologies than before, with a potentially disruptive effect on employment and society.

Second, digital transformation is impacting how organizations operate through a changed role of the IT. Traditionally the corporate IT department was responsible for providing access to digital technologies, however, with the availability and role of digital technologies in society shifting, so does the role of the IT department. IT capabilities and the effective management of IT resources have long been perceived as enabler for organizational performance (Bharadwaj, 2000) or organizational agility (Lu & Ramamurthy, 2011). The alignment of IT strategy and business strategy in organizations has been a key topic in IS research as well as a relevant challenge for practitioners (Reynolds & Yetton, 2013). Traditionally the corporate IT department had the role of a service provider, but as early as 1993, Henderson and Venkataram recognized the shift towards a more strategic role of IT (Henderson & Venkatraman, 1993). This requires not only an alignment between business and IT strategy, and mutual understanding between CEO and CIO (Benlian & Haffke, 2015; A. M. Johnson & Lederer, 2010), but rather a different collaboration model between business functions and IT department, as to an increasing degree also non-IT functions within the organization innovate with digital technologies (Tumbas, Schmiedel, & Vom Brocke, 2015). In order to facilitate innovation, the internal IT department proactively explores the potential of new digital technologies, whereas at the same time ensuring regular IT operations of existing systems. For this, a bimodal IT approach has been adopted by many organizations in order to ensure an increased agility for their digital service creating (Haffke, Darmstadt, Kalgovas, & Benlian, 2017). The emerging importance of digital technologies for a company's service offering, organizational agility, and corporate strategy has led to many companies introducing the new role of a Chief Digital Officer (CDO), who is responsible for strategic aspects of the digital transformation, facilitating innovation, or coordinating transformation activities (Horlacher & Hess, 2016; Singh & Hess, 2017).

Third, digital transformation changes how organizations generate value through digital innovation in the product and service offering (Nylén & Holmström, 2015) and consequently enables business model innovation (Ebel, Bretschneider, & Leimeister, 2016). In a fast moving technological environment, with new requirements and behaviors of the network society, and the ongoing digitization, the architecture of products changes by combining digital devices, services, networks, and content (Yoo, Henfridsson, & Lyytinen, 2010). This may accelerate the growth of a company but also be a challenge

for incumbent firms in terms of how they organize their innovation management processes. Digital innovation challenges these companies as it brings up competing concerns in their capabilities, focus, collaboration, and governance (Svahn, Mathiassen, & Lindgren, 2017). A fruitful resource for creating digital innovation is monitoring user needs for long-term innovation as well as customer needs for short-term changes in market needs (Abrell, Pihlajamaa, Kanto, vom Brocke, & Uebernickel, 2015). Huang et al. also identified the continuous analysis of user data as important basis for identifying opportunities for digital innovation besides the ability to re-invent the value proposition and redefine a product's identity (Huang et al., 2017). The latter is a trait that is facilitated by an organic organizational structure that is more flexible and allows for easier information exchange, which, however, might change after a phase of radical innovation and become more separate (Green & Cluley, 2014). Organizations increasingly open organizational boundaries and form innovation networks by turning to external partners and tools in order to assess external, heterogeneous knowledge (Lyytinen, Yoo, & Boland Jr., 2016). Different innovation practices require a different type of agency with different processes, participants, and tools to orchestrate the innovation process (Nambisan et al., 2017).

Fourth, as a consequence, managers have begun to create a dedicated digital transformation strategy to actively advance the change process in their organization. The view on IT-strategy has emerged from a purely functional strategy to an alignment with business strategy, to a fully integrated digital business strategy (DBS) (Bharadwaj, El Sawy, Pavlou, & Venkatraman, 2013). A DBS is being used to define how a company uses digital technologies in order to create value for their users and thus creates a competitive advantage (Grover & Kohli, 2013; Pagani, 2013). As a basis for digital business models the DBS therefore focuses on customer experience of digitized solutions (Ross et al., 2016) and includes aspects such as culture, leadership, customer experience, vision, and organizational capabilities (Holotiuk & Beimborn, 2017). Recently, researchers have also been interested in the formulation of a digital transformation strategy that is explicitly directed towards systematically defining the transformation of an organization towards the digital age. It bears similarities to the DBS in the sense that digitization is the central driver, but explicitly acknowledges the transformation of the organization. Matt et al. include the dimensions use of technology, changes in value creation, structural changes, and financial aspects (Matt et al., 2015) and therefore provide a holistic approach to a company-wide transformation that is approached in a structured and strategic way (Hess, Matt, Benlian, & Wiesböck, 2016). On the other hand, digital transformation

strategies may also arise bottom-up from diverse activities in separate organizational units and only be aligned in a unified digital transformation strategy at a later point in time (Chanias & Hess, 2016).

Reviewing the prior research in this field shows that digital transformation is a complex change that comprises different levels in the organization. While for the organization digital transformation is a strategic process that managers actively manage, design, and implement, it is for the most part initiated by external triggers, such as the digital user and the network society. As consumer, the digital user requires a different approach to customer experience. As employee, the digital user demands different approaches to leadership, collaboration, and culture within the organization. The change in internal operation includes managerial tasks and mutual collaboration between executives in defining the strategic direction of the organization, but also extends to the transformation of organizational structures and routines and, in addition to that, may impact the business model and thus, how an organization generates value in the digital age.

2.3 Fuzzy Front End

Initiating an innovation project is a difficult task as the outcome, process, and participants may not be clear. The fuzzy front end (FFE) refers to the mysterious, random, and ill-defined stages in the beginning of an innovation project (Rhea, 2003), before the project enters the more systematic stage-gate process (R. G. Cooper, 2008). This phase is often referred to as the weakest and yet most critical aspect in the innovation process (Khurana & Rosenthal, 1997). The concept of the FFE is to this day exclusively found in the research on product innovation and new product development. However, I argue that drawing on this concept bears many aspects that are related to the initial process of an organizational transformation and strategy formation. The most relevant facets of prior research on FFE of innovation are presented in the following paragraphs.

First, the FFE is characterized as a phase of experimentation with new ideas, technologies, and external stimuli. Companies certainly turn to experimentation techniques, such as simulations and rapid prototyping, for trial-and-error learning (Thomke, 1998). Experimenting with new techniques can be seen as „low-cost probes into the future“ (Brown & Eisenhardt, 1997) while regular operations may continue being unaffected. The drivers for experimentation activities are external stimuli, such as new technologies or market needs. Therefore, knowledge about the market, learning about changes in

needs, and external networking are valuable capabilities (Reid & Brentani, 2012). Techniques that organizations use for the creation of ideas are e.g. traditional market research, brainstorming, or design thinking, which allow companies to identify solutions that can be applied to existing problems, that exploit existing knowledge or invent new solutions (Chadha, Mehra, Gregor, & Richardson, 2015). The activities related to experimentation in the FFE are focused on integrating both technology push (for identifying promising solutions) as well as market pull (for identifying user requirements) activities (Brem & Voigt, 2009). In order to successfully create innovative ideas from such external stimuli, openness is an important success factor, which refers to the capability of an organization to gather information from external research and inter-organizational partnerships (Thanasopon, Papadopoulos, & Vidgen, 2016). Assessing an idea's feasibility through prototyping is valuable, since it allows an organization to get external validation (e.g. by research labs) and facilitates discussion of discordant information (Gupta & Maltz, 2015).

Second, during the FFE a number of analytical activities are conducted in order to bring more clarity and structure to the random process. Uncertainty in the front end process is perceived as something negative and thus organizations aim at minimizing this perturbation. This can be achieved through structuring the front end process in an early stage already, through concept development and documentation, concept rating and structured assessment of ideas (Montoya-Weiss & O'Driscoll, 2000). To improve the structure of the front end process, researchers explore how companies can improve factors such as higher process formalization, knowledge management, or strategy management (Jin, Chai, & Tan, 2014). A study by Eling et al. has shown that consistently taking a portfolio perspective in selecting ideas ensures the alignment with the company's overall strategy and the advancement of both incremental and radical ideas (Eling, Griffin, & Langerak, 2014). When confronted with new ideas from inside or outside the company, the objective of the analysis is to link these innovative product ideas to market opportunities, which is referred to as market visioning capability (Reid & Brentani, 2012). Tiwana points out that in assessing new technologies that emerge, the challenge is to separate signals from noise, where the noise might be the manager's underlying cognitive bias that leads to underestimating risks from involving partners, wrongly assessing uncertainties, or misjudging the timing. This can be mitigated through the use of frameworks that help CIOs to correctly assess these situations (Tiwana, Konsynski, & Venkatraman, 2013). However, sometimes the cause of uncer-

tainty is less complex and merely caused by communication issues, which may be improved through a common language and definitions of important elements (Koen et al., 2001).

Third, the FFE is a highly collaborative and networked phase that requires multiple stakeholders to exchange information and interact on a variety of activities when developing a more precise idea of the innovative product. This collaboration involves different groups such as a diverse innovation team for screening and developing ideas, and senior management for making the decision (Yan & Ma, 2015). The "fuzziness" in the FFE mostly arises from equivocality. However, adding more information from the outside may not always improve this uncertainty (Gupta & Maltz, 2015). In order to exploit early-stage innovation ideas some companies install an innovation board, which does not design innovation itself, but provides training, decides on budgets, and assists early ideas to enter formal development (Markham & Lee, 2013). Success factors that may foster the collaboration within an innovation team are interpersonal interactions, a high degree of cooperation between different functions, but also the ability to resolve conflicts within the team (Boukis & Kaminakis, 2014; Christiansen & Gasparin, 2016). Since emerging technologies and information from outside the company facilitate disruptive innovation, individuals that spread this information within the organization play an important role in information flow. De Brentani and Reid have identified three key roles – boundary spanner, gate keeper, and project broker – that are critical in linking external information to the company, assessing the value of this information, and move it from the individuals further into the organization (de Brentani & Reid, 2012a). The fact that outside information plays an important role is supported by a study that showed that highly innovative Asian companies are more "extrovert" and interact with external industry networks, suppliers, external experts and customers (Godoe, Vigrestad, & Miller, 2014).

This review of prior research on the FFE in product innovation reveals that experimenting, analysis, and collaboration are key activities in this phase. Experimenting is an approach to explore possible future applications and solve problems through trial-and-error learning. The results of the experimentation phase need to go through an assessment in order to ensure their feasibility and alignment with the product strategy, before these ideas and concepts enter the formal phase of development which concludes the FFE process. In this phase different stakeholders from various background need to collaborate, resolve conflicting opinions, and reach common decisions. Improving the front

end phase always depends on the context in the company. Therefore, there it is not possible to identify the optimal front end process or universal best practices to improving this phase (Nobelius & Trygg, 2002; Reinertsen, 1999). Also, it becomes apparent that while many approaches exist to structure the FFE phase, a certain degree of flexibility, exploration, and trial-and-error is necessary in order to facilitate the creative process of innovation. The chosen activities and methodologies may also vary depending on the type of innovation process, as Gregor and Hevner show in their "Knowledge Innovation Model" on how invention, exaptation, advancement, and exploitation practices differ (Gregor & Hevner, 2015). For organizations the FFE is a phase between a familiar past and an unknown future and where managers and employees go through activities such as recognizing differences between new ideas and current practices, imaging a possible future state and trial-and-error learning in order to shift to a new direction (Henfridsson & Yoo, 2014).

2.4 Research Gap

Even though organizational change is a natural part of an organization's life, managers struggle with initiating a profound and transformative change in the digital age (Hess et al., 2016; Vey, Fandel-Meyer, Zipp, & Schneider, 2017). The challenges that emerge through digitization are similar in most industries, yet when managers sense that technological change may affect their organizational structures, product offering or business model, they do not know how to approach this phenomenon (Agarwal, Johnson, & Lucas, 2011), that is – while being theoretically well explored – new to them and requires a different collaborative approach (Bettis & Prahalad, 1995; J.-L. Denis et al., 1996; P. Spee & Jarzabkowski, 2017). Managers fail to recognize the potential impact or lack imagination for a new strategic vision (Vey et al., 2017). The exact processes how digital transformation strategies form in organization are less researched, an exception being the study of Chanias & Hess in the automotive industry (Chanias & Hess, 2016). In order to assist managers with designing a viable digital transformation strategy for their organization, this dissertation is aiming at exploring the specific challenges in the FFE of digital transformation, providing instruments to support the sensemaking and analysis process, and describing typical and possible activities and approaches in order to show how to navigate this demanding phase.

The FFE is a new perspective on the initial phase of organizational change processes. While the literature on organizational change as punctuated equilibrium (Romanelli &

Tushman, 1994) acknowledges the first phase, it mainly uses a perspective of organizational inertia (Tripsas & Gavetti, 2000), for instance in Kurt Lewin's three stage model of change (Lewin, 1963). It specifically points out the first step in change as unfreezing, and thus, as phase where organizations have to make sense of external signals and recognize the need to change. From prior research in the product innovation domain we know that the initial phases have a significant impact on the course and outcome of the process (Rhea, 2003; P. G. Smith & Reinertsen, 1991; Verworn, 2009). Thomas et al. researched the relationship between sensemaking activities and organizational performance (Thomas, Clark, & Gioia, 1993). It can be assumed that the same holds true for organizational change and for this, the front end stage of strategy formation is rather neglected in research.

Organizational change strategy in general is a well-researched field (ÇelİK & Ozsoy, 2016; Gioia & Chittipeddi, 1991; Wischnevsky & Damanpour, 2006). However, in digital transformation, there are some changes in this perspectives. The classical strategic planning process bears some challenges for digital transformation. First, in the dynamic development of digitization, the planning cycles become much shorter than before. With regards to digitization planning for more than two years onwards is less effective since many relevant developments cannot be foreseen that far into the future. Second, the team responsible for strategic planning may be different and involve different people outside the usual strategy department (Jean-Louis Denis, Lamothe, & Langley, 2001; Higgins, Weiner, & Young, 2012; P. Spee & Jarzabkowski, 2017), such as IT or even junior members of different business units. Third, the managers involved in strategic planning need to have a broader knowledge on digital technologies than they used to have before or engage with the IT department in strategy formation (Urbach & Ahlemann, 2017). This is due to strategy being less dependent on economic factors and more on technological development as well as its impacts on society. These aspects show that the strategy formation process in digital transformation is different to organizational change strategies.

Using the FFE as new perspective to the initial phase of digital transformation seems to be a fruitful approach since the product innovation process and digital transformation as organizational innovation process bear many similarities. Prior research on the FFE in the development of new products has pointed out the relevance of collaboration (Yan & Ma, 2015) and information flow (de Brentani & Reid, 2012a), the use of experimentation as creative methodology (Thomke, 1998) and structuring frameworks for analysis, which also holds true for the initiation of digital transformation. These two innovation

processes differ in that sense that digital transformation of organizations is, as a matter of fact, more complex than product innovation, since it involves more organizational units (Elliot, 2006; Henderson & Venkatraman, 1993), different participants (Abraham & Junglas, 2011; Singh & Hess, 2017), and a different and varying set of activities.

2.5 Research Questions

Based on this theoretical review it becomes apparent that the FFE of digital transformation and the formation of strategies in the digital transformation are worthy of further exploration. The guiding research question for this dissertation is: *How do activities related to experimentation, analysis, and collaboration in the fuzzy front end of digital transformation contribute to initiating organizational change?*

In order to answer this overarching question, it is divided into more specific research questions that form the basis for the different contributions of this dissertation. First, it is key to identify what consideration the first stages of an organizational change process find in prior research and if the characteristics of the FFE in new product development are comparable to those in digital transformation. Thus, the first set of research questions addresses the overall exposition of the topic and introduces the FFE as a new perspective to observe the beginning of digital transformation (contribution A).

- *RQ1.1: To what extent does the fuzzy front end phase find consideration in current literature?*
- *RQ1.2: What are important characteristics and challenges within the fuzzy front end of digital transformation?*

The second research question addresses a typical approach of experimenting in the FFE, how managers can sense and assess the impact of a technological innovation for their business model. Using the case of a car manufacturer that explores the potential utilization of wearable technology for the driver, contribution B outlines user requirements and utilization scenarios.

- *RQ2: What are user requirements and possible utilization scenarios for innovative technologies?*

The third set of research questions aims at describing the phenomenon of digital transformation in detail and gaining more insight into the analysis phase of the FFE. Since there is no general understanding of digital transformation, the goal is to define the dimensions of an organization that are affected by digital transformation, to develop an

instrument that allows to assess the current state of the organization (contribution C), as well as describes the overall stages of digital transformation (contribution D).

- *RQ3.1: Which organizational areas are affected by digital transformation?*
- *RQ3.2: How can managers assess the status quo of digital transformation within their organization?*
- *RQ3.3: What stages constitute the process of digital business transformation and how do organizations prioritize different courses of action?*

Finally, the fourth set of research questions addresses the procedures and collaboration during the initiation of a digital transformation program and aims at exploring typical stakeholders, activities and approaches in setting up a digital transformation strategy and program within the organization (contribution E).

- *RQ4.1: What are patterns of typical activities in the fuzzy front end of digital transformation?*
- *RQ4.2: How do companies approach the initial stage of a digital transformation program?*

3 Research Design

In order to answer the research questions outlined in the previous section, this dissertation engages in four different research projects, which combine different methodologies.

The first project (RQ1.1, RQ1.2) is directed towards exploring the results of prior research on the fuzzy front end (FFE) of digital transformation through a literature review of leading journals in the information systems, management, and organization science domains. Organizational transformation of any kind, whether it was induced by technology or other external or internal triggers, has long been in the interest of researchers in multiple domains. The goal of this literature review is to understand to what extent the initial phase of strategy formulation for organizational transformation – the FFE – has already been covered and discussed in prior research. From each domain, information systems, management, and organization science, the top journals (A / A+ ranked in VHB Jourqual 3.0[1]) have been selected and 39 journals formed the database for the literature search. These journals are searched for the term "organizational change" in combination with "strategy formation" / "strategy formulation" / "strategic planning", in order to identify previous research with focus on the initial planning phase. In total, 112 papers are analyzed in this research project.

The second research project (RQ2) focuses on the experimentation with new technologies. It was initiated in collaboration with a car manufacturer with the objective to assess the potential of wearable technology. This new technology seems promising to enhance the driver's experience or allow added services, however, it is not clear what utilization scenarios could potentially offer added value. In this research, we combine several research methods in assess the potential of wearable devices as well as cover both technology push and market pull perspectives. First, we conducted a literature review on existing user requirements for wearable technology and analyzed twelve publications in depth; second, we performed a market analysis on 136 available devices and their capabilities; third, we developed customer journeys clustering multiple utilization scenarios; and fourth, presented these results in a focus group with six participants for discussion and validation.

The third research project focuses on the managerial and analytical perspective of digital transformation. For this, we use the design and instantiation of a digital maturity

[1] The complete list of VHB Jourqual 3.0 ranking can be found here: http://vhbonline.org/vhb4you/jourqual/vhb-jourqual-3/gesamtliste/

model. In a first step (RQ3.1, RQ3.2), we develop the dimensions of the maturity model based on the business engineering framework through a literature review of 70 academic publications and 16 comparable maturity assessments, as well as seven expert interviews. These dimensions have been evaluated in focus group interview with eleven practitioners. Subsequently, a list of items is developed in a collaborative way. The items are evaluated in a second focus group with six practitioners and the list with 59 items is finalized based on this feedback.

The second survey forms the basis for exploring the stages of digital transformation (RQ3.3). Instead of defining the maturity stages qualitatively from interviews or literature, we decided to take a quantitative approach in order to deduct the maturity stages from empirical survey data of 547 participants. By applying the Rasch-algorithm to the survey data, we derive a difficulty score for each item and by using hierarchical cluster analysis, we calculate five maturity stages. These stages reflect the difficulty of the items and thus give an indication how organizations prioritize activities in digital transformation.

The last research project is directed towards delineating typical activities and approaches in digital transformation (RQ4.1, RQ4.2). We use multiple case examples and apply activity theory as a guiding framework for a structured, in-depth analysis. The cases are selected from the applications for a "digital transformation award" in 2015 and 2016. For each case example, we analyze the results of an online survey (based on the item list of digital maturity model), written statements on the main progress within digital transformation in the past 18 months, and complementary documents. Also, we triangulate this data with 18 additional interviews. By clustering the results according to the activity theory framework, we delineate and describe nine sets of typical activities in the FFE of digital transformation. In a second step, we analyze the order in which these activities are initiated in the different organizations and deduct five different approaches to initiating digital transformation.

4 Contributions

This thesis consists of several research projects that contribute to the overall goal of understanding the characteristics of the fuzzy front end (FFE) of digital transformation and how organizations act and approach this major transformation for their organization. Contribution A lays out the theoretical perspective and identifies the research gap; contribution B provides insight on an experimentation activity in the FFE of digital innovation; contribution C delineates the dimensions of digital transformation and describes the design of an instrument for analysis of affected areas for transformation; contribution D contains the implementation of this instrument and results of a benchmarking study; and, finally, contribution E identifies the collaborative activities in the FFE of digital transformation.

4.1 The Fuzzy Front End of Digital Business Transformation

While the concept of the FFE is well known in the new product development (Gassmann & Schweitzer, 2014; Koen et al., 2001; Reinertsen, 1999), the concept has not been transferred to the organizational innovation context yet. The purpose of contribution A is to find out to what extent the comparable stage in strategy formation is recognized in prior research and what characteristics and challenges apply to the early stages of strategy formation.

The literature review of prior research on organizational change strategies shows that the initial phase of transformation strategy formation finds less recognition in research than other phases, such as planning or implementation. The analysis reveals as well, that research covers evolutionary types of organizational change more frequently than radical transformations. Central research topics the information systems domain are the alignment of business and IT strategies, technology adoption, and the changing role of IT in business. The perspective in the management and strategy literature is directed more towards the external influences of organizational change as well as the role of top executives. In the organizational science domain, the research focus is on the entire workforce, a perspective that is seldom considered in the other domains. The research has also unveiled that similar concepts to the FFE exist, but are not specifically addressed in research. For instance, the FFE corresponds to the stage of “unfreezing” in Kurt Lewin’s three-stage model of change which is frequently being used in research to explain organizational change (Lewin, 1963).

This introductory literature review contributes to this thesis by showing that the FFE of digital transformation is a promising perspective, since most research focuses on the implementation of change processes and less on the initial phase. The characteristics identified in the different domains contain aspects of sensemaking, collaboration, and changed role of the IT and thus indicate that the initial stage of strategy formation in organizational change bears similarities to the FFE in product development, however, has not been specifically recognized in research.

4.2 Requirements Elicitation and Utilization Scenarios

The purpose of the second research project is to explore typical experimentation activities in a real-life setting of a new technology being introduced. The research project uses the case of an automotive manufacturer assessing potentials of wearable devices and define utilization scenarios for these devices in combination with the automobile.

The research project begins with a definition of wearable technology. Wearable devices have become more present in the consumer technology market in the recent years and are characterized by four criteria: (1) they are worn on the body as opposed to carried, (2) they allow for sensory input, (3) they are connected to other devices or platforms, and (4) we exclude devices that are single-purpose only and focused on devices that potentially cater for multiple purposes. Through literature review and a focus group we deduct user requirements regarding physical form (unobtrusiveness, beauty); interaction design (intuition, connectivity); functional features (sensory input, compatibility, multi-purpose capability); and intelligence (contextual intelligence, personalization, anticipation of user needs). In order to identify possibilities how wearable devices can be used in the automotive context, we develop utilization scenarios through market analysis and the customer journey presented in the focus group that are based on the user requirements elicited in the first step. The scenarios identified are related to authenticating the driver, monitoring physical conditions, interacting with the vehicle interface, projecting information as augmenting reality, and interacting with connected objects.

The contribution of this research project for this thesis is a better understanding of a typical experimentation and exploration setting in the arrival of new technologies. The focus in this research project is to understand user requirements and develop possible scenarios, without evaluating the potential business cases. This experimenting is one typical step in the FFE. Evidence for this activity is also found in contribution E. One

of the typical approaches identified in the case study research involved the experimentation with new technologies in the innovation-centric approach. Similar activities to what we did in contribution B, take place in dedicated innovation teams, in cooperation with start-ups, for instance in start-up accelerator and incubator programs, or by collaborating with other partners, such as design agencies or universities. Idea contests or internal hackathons serve to quickly develop prototypes for new ideas, evaluate feasibility, usefulness, and potential for further development. This contribution has also shown that experimenting with new ideas and technology, uncovering requirements, and designing utilization scenarios is a fruitful way to create more clarity in the FFE. While in the beginning of an innovation process the possible outcome of an innovation is obscure and ambiguous, experimentation techniques help to approximate new ideas and uncover hidden potentials.

4.3 Dimensions of Digital Transformation

The purpose of this contribution is to develop a definition of digital transformation and design an instrument that assists managers that are struggling to make sense of digitalization to better understand its impact on the organization. Therefore, we developed a maturity model that aims at (1) allowing companies to identify where they stand in the context of digitization, (2) creating a common vocabulary and grasp in order to facilitate internal discussion, (3) compare the status quo of their company to the overall state of digitization as well as their industry.

Through a literature review and various focus groups, we identified nine dimensions of the digital maturity model, based on the business engineering framework, which allows a holistic view on organizational transformation processes. Contribution C summarizes the maturity criteria and a list of items for each dimension of the digital maturity model, which are customer experience, product innovation, strategy, organization, process digitization, collaboration, information technology, culture & expertise, and transformation management. The item list created in contribution C serves as basis for an online survey that is published under the name “Digital Maturity Check” and is conducted on a yearly basis. So far, it has been applied in three surveys: The first survey lasted from November 2014 to February 2015 with 196 participants; the second from October 2015 to February 2016 with 547 participants; and the third from October 2016 to February 2017 with 662 participants. For each round the items have been evaluated and updated through a focus group interview (first round: 59 items, second round: 60 items, third round: 64 items).

The contribution of this research project is a systematic definition of all organizational areas affected by digital transformation and, thus, a holistic understanding of digital transformation. The second contribution of this project is the digital maturity model as a management instrument to systematically analyze and assess the status quo of the organization, as boundary object to facilitate discussion, and as basis for a survey that helps organizations to assess their current state in comparison with the industry benchmark.

4.4 Stages in Digital Business Transformation

The purpose of this contribution is to identify how companies prioritize different activities and outline typical development stages in digital transformation. This research project extends the unit of analysis from the FFE to further stages in digital transformation.

The results of the survey in 2015/2016 have formed the basis for contribution D. These findings show stages in digital transformation that have been derived from the 547 participants of the survey. The analysis of the survey data gives an indication of what activities have already been conducted by most companies and are therefore easier to accomplish, and what activities are more difficult and have not been tackled by most companies. The stages have been modeled from cluster analysis and show a typical prioritization and order of the activities based on the items of the digital maturity model. The findings of this contribution show that in the first stage (“promote & support”) companies focus on making digitization a priority in their corporate strategy, creating management support, and initiating basic digital services. In the second stage (“create & build”), digital innovation and the creation of digital services is in the center of attention. The third stage (“commit to transform”) contains more activities related to culture and organization, which shows that the digitalization efforts also impact the processes and culture within the organization. The items clustered in the fourth stage (“user-centered & elaborated processes”) indicate that companies open their innovation processes, improve processes through data analysis, and create a more personalized user experience. In the fifth stage (“data-driven enterprise”), the items with the highest difficulty metric are related to the use of advanced data analytics in customer experience or internal processes.

This research project contributes to our further understanding of how organizations approach and navigate through the digital transformation process and identifies typical

stages based on quantitative survey data. This research project gives an indication of how activities are prioritized in most companies, however, they do not necessarily indicate a linear or ideal transformation path. However, the digital maturity model has proven to provide a complete view on digital transformation. It has been used in research and practice to facilitate conversation around possible areas of action in digital transformation. Experience with the model and the survey has shown that the maturity score calculated is not of great relevance for the companies, since it gives little indication about areas of action. The same holds true for the benchmarking functionality. While a comparison with the industry benchmark is interesting, the real value for companies is the process of filling out the questionnaire. This creates a common sense of urgency, helps to communicate internally, and facilitates an internal discussion around digitization.

4.5 Disentangling the Fuzzy Front End

The purpose of the research project in contribution E is to identify typical sets of activities in the FFE of digital transformation and analyze how companies initiate these activities. The research is based on eleven case examples and uses activity theory as a structured framework to describe these activity systems in a systematic way.

The analysis of the case study material reveals nine typical activity systems: (1) improving digital channels; (2) defining processes and IT-infrastructure; (3) adapting work practices; (4) creating innovative digital business models; (5) developing a digital strategy; (6) aligning transformation initiatives; (7) defining governance; (8) changing organizational culture; (9) strengthening collaboration. For each activity system a description of the objective, stakeholders, tools, rules, other participators involved and how labor is divided, is included. As a next step, it is being analyzed in what order the activities are initiated in the eleven cases in order to find out how activities are prioritized and how companies initially approached digital transformation. This analysis yields five different approaches: (1) the centralized approach, where companies first develop a digital strategy and then assign the respective tasks to different teams in the organization; (2) the bottom-up approach, where different initiatives are brought up in various units of the organizations that are subsequently consolidated into an overarching transformation program; (3) the IT-centered approach, where the focus is on simplifying business processes and developing a flexible and agile IT infrastructure first; (4) the innovation-centered approach, where companies focus on experimenting with new dig-

ital technologies and develop new digital services and business models; and (5) the channel-centered approach, which is focused on the improvement of digital channels in order to create a better customer experience.

These approaches were included in our third survey on the digital maturity model. The survey question included was: „Which of these approaches best reflect how your company initially started your digital transformation program. By taking 662 answers from this survey into account, I can provide some more context on the approaches than was originally included in contribution E. The results show no clear indication of one approach being favored over the others. All approaches are well accepted within a number of organizations. Most companies (23%) engage in a centralized approach by building a digital transformation strategy first and then start assigning projects to different teams within the organization. The innovation-centered approach that is characterized by organizations experimenting with new digital technologies and trying to create new digital services or even business models, is undertaken by the smallest number of companies in our survey (14,5%).

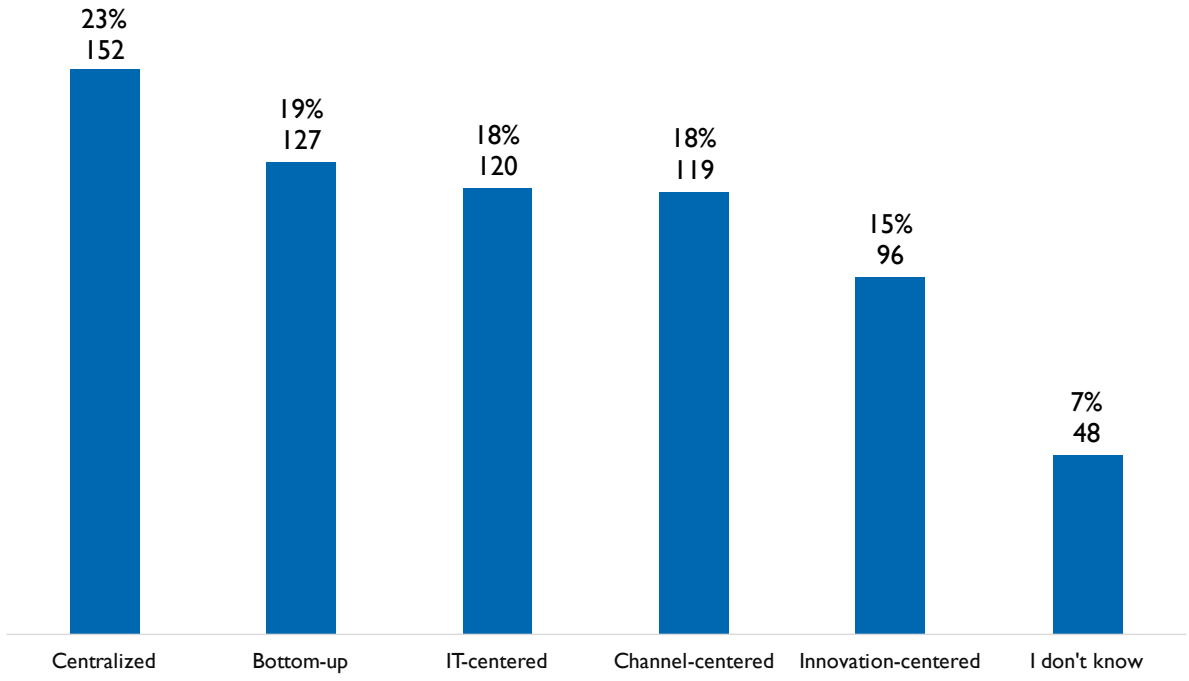

Figure 2: Approaches to initiate digital transformation. Results from the survey 2017 (N=662)

However, an interesting difference can be observed between companies with a high maturity score and those with a low maturity score. The comparison of approaches shows that companies with a low maturity score mostly engage in an IT-centered or bottom-up approach, whereas companies with a high maturity score mostly undertake a top-down or innovation-centered approach. These opposing approaches indicate that

companies with a low maturity score might be lacking a planned approach to digital transformation and see it rather as an IT-centered project, whereas companies with a high maturity score have a more open perspective on digitalization and are open to experiments and risks.

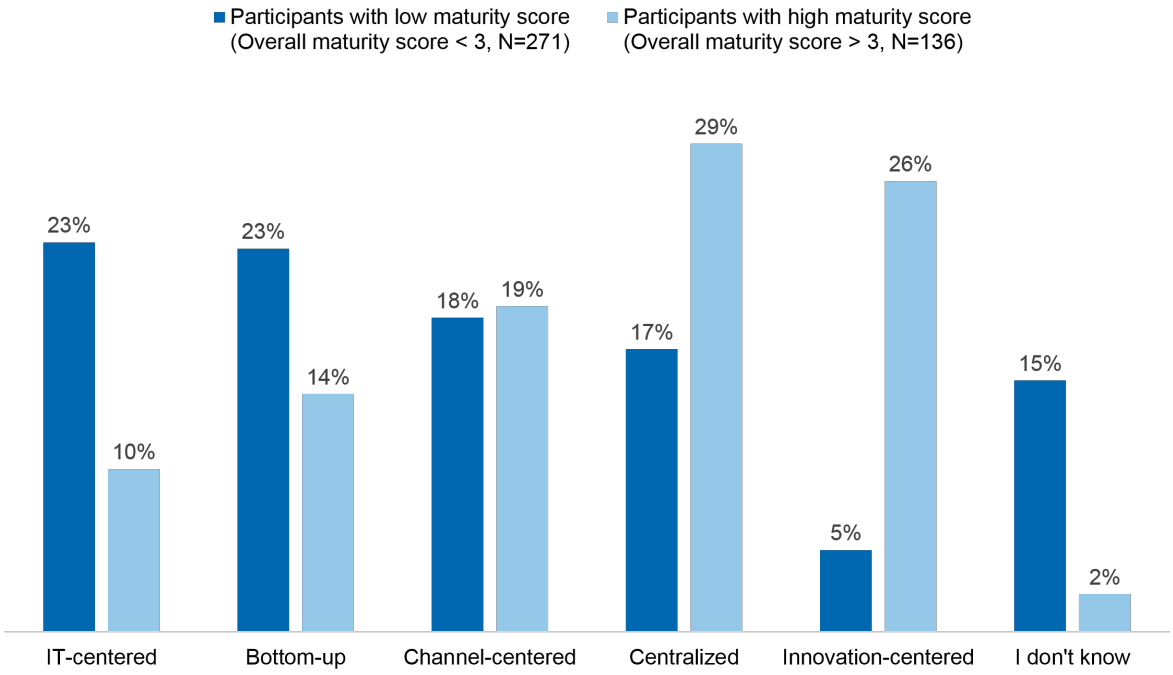

Figure 3: Comparison of approaches of companies with low and high digital maturity scores.

The contribution of this research project to this thesis is a structured analysis of the activities to enact a digital transformation strategy and create change within the organization. Also, the order in which these activities are initiated gives an indication how companies approach digitization and organizational change. While the results of contribution C provide a structured list of criteria referring to specific activities that an organization ideally should have undertaken in the digital age, and in contribution D the maturity stages are based on the difficulty score from the quantitative results of a survey, this contribution provides richer insights and more detailed descriptions of the activity systems from case study data.

5 Discussion

The findings of the different studies within this dissertation have introduced the fuzzy front end (FFE) in the digital transformation of organizations as research gap, illustrated the various activities, and approaches that businesses undertake to initiate a transformation program. Many of the generated insights provide the basis for reflection, theorizing, and attempting new directions of providing solutions. Five distinct perspectives appear particularly tangible and pressing.

5.1 Fuzzy Front End of Continuous Change

Observing a single instance of change might lead to a simplified understanding of the FFE of digital transformation: an organization needs to navigate through the first fuzzy stages until it reaches a mutual understanding and once the strategic team has collaboratively agreed on a strategic direction, the structured implementation process starts and the FFE has ended. However, this process is likely far more complex. Often, clear beginnings and endings of a change process cannot be defined. As pointed out in the theory chapter of this dissertation, change is natural in organizations and occurs in different types. In most incumbent organizations, phases of relative stability with continuous improvements and smaller change projects alternate with phases of accelerated and more profound change and growth where organizations take an entrepreneurial approach (Mintzberg & Waters, 1982). Therefore, the FFE is not a single instance of a distinct change process, but is rather a constant process in different innovation projects or organizational units. For managers, this means that the FFE activities of experimentation, analysis, and collaboration that are needed to define a vision and concept for innovation become part of the organizational routine and managers may continuously take action in evaluating potential options for strategic change (Brown & Eisenhardt, 1997; van Aartsengel & Kurtoglu, 2013).

The strength of the FFE phase is its creative potential and the exploration of multiple possible options for digital transformation. However, it can be time-consuming and requires challenging previous assumptions about the organization. Companies that can use the FFE activities to their advantage, also master the continuous innovation of their organizations. At the same time, continuous innovation has to be balanced out with focus on the core business model.

The FFE has been used in this research as a new perspective on digital business transformation and proven to be a useful frame for research. However, it also illustrates the

differences between this initial phase in digital transformation of an organization and in product innovation: the FFE of digital transformation is presumably more challenging as, there are likely more and more diverse groups of stakeholders involved. Thus, the set-up of the process is commonly not part of an incumbent company's standard managerial routine. Consequently, the FFE of digital transformation processes is less understood while providing numerous degrees of freedom in design.

5.2 Scope of Digital Transformation

In the current discussion on digital transformation, there are expressions being used such as "digital darwinism" (e.g. Kreutzer 2014) with the "digital dinosaur" that is doomed to extinction and the "digital champion" surviving and striving. This narrative implies that a high degree of digitization is desirable and companies that put an emphasis on digitization e.g., through process automation, digitized products or hybrid product-service systems, or in their customer communication are also economically more successful than others.

There is no universal answer to the degree of digitization that makes an organization successful. In literature, there are case studies of companies that benefit from successfully implementing very innovative and digital activities, e.g. Hilti (Jan vom Brocke et al., 2017), as well as popular examples of companies that failed in digital transformation, e.g. Kodak (Lucas & Goh, 2009). However, there is also support that not all disruptive events from the environment come with a disruptive impact on traditional non-digital businesses (Wenzel, Wagner, Wagner, & Koch, 2015). The scope, objective, and degree of digital transformation depends on the individual market, competitive positioning, and customer value proposition, and thus leads to an individual path and successful destination for each organization.

The results of the second and third recurring study based on the digital maturity model have indicated that companies that reach a high maturity score also rate themselves more successful in criteria such as customer satisfaction, employee satisfaction, productivity, and innovativeness (Berghaus, Back, & Kaltenrieder, 2016). While these results support the fundamental assumption of digitalization driving business performance, these findings must be considered in light of the data being generated by self-evaluation of its participants. Furthermore, this result neither indicates causality in a sense that compa-

nies that are conducting more activities related to digital transformation are more successful as a consequence, but it could also suggest that economically successful companies are willing to invest more financial and personal resources in digitization.

To conclude, even though digital transformation is a well-resonating topic with the IT-industry and consultants alike, digitization itself should not be the objective of an organization, but the means to achieve the underlying business goals, such as increasing value for customers, increasing efficiency, or generating scale effects.

5.3 Measuring Digital Transformation Maturity

When we began to design the digital maturity model in 2014, there were not many comparable instruments available for this kind of analysis. Those that were published, rather resembled simplified checklists or only focused on very limited aspects of digital transformation, e.g., online communications. Through conversations with decision makers in several industries, we found that different business units as well as industries had a different understanding of digital transformation. One goal of maturity models is to indicate possible paths to a desired future state (J. Becker, Knackstedt, & Pöppelbuß, 2009; Pöppelbuß & Röglinger, 2011; Röglinger, Pöppelbuß, & Becker, 2012). However, in digital transformation there is no state of "ideal" digitization, which makes it impossible to design a maturity model with a prescriptive function. The model and the maturity score as result of the survey gives no indication how to reach the next maturity stage and whether this is a desirable state for the specific organization at hand. Besides the calculation of the maturity score and the benchmark with industry competitors the reflective process of filling out the questionnaire as well as the discussions this facilitated within the organization were valuable results for organizations. The stages of digital transformation, identified in contribution D, are not to be understood as linear path, but are a result from the difficulty score that is based on the survey data and thus give an indication how the criteria of the digital maturity check are prioritized in these companies. These results are used to get a better understanding, how companies approached their digital transformation in the past three years from 2014 to 2017.

Information systems assist managers in the strategy development process, by facilitating discussion, developing concepts, and support decision-making (Osterwalder & Pigneur, 2013). In this sense, the digital maturity model and the corresponding questionnaire may be used together with other tools of non-linear strategy development that support the reflection process on the business model of an organization (Osterwalder &

Pigneur, 2010), serve as boundary objects (A. P. Spee & Jarzabkowski, 2009), or assist managers in designing multiple options for development of the organization (Balarezo & Nielsen, 2017).

To sum up, the use of the digital maturity model in the FFE of creating a digital transformation strategy support the "strategy as design" perspective, where the strategy formation process seeks to match the external opportunities with capabilities of the organization (Mintzberg et al., 1998). The digital maturity model both helps to assess internal competences and activities and compare these with potential possibilities for development.

5.4 Innovation Potential & Innovation Theater

The FFE of digital transformation is often induced by new digital technologies that cause user behavior or markets to change. In these cases, companies react to external impulses. The ability to recognize the potential value that can arise from new external information and make use of this information is labeled the absorptive capacity of organizations and has a great impact on innovation performance (Trantopoulos, von Krogh, Wallin, & Woerter, 2017). Cohen & Levinthal argue that prior related knowledge and diversity of backgrounds within the organization are of advantage and increase the absorption and usage of external information (Cohen & Levinthal, 1990). As seen from contribution E, in order to make sense of new technologies, companies launch new business units of teams dedicated to innovation, such as innovation labs, start-up incubators or accelerators, where experts for digital innovation with different backgrounds collaborate on new business models. While this approach has become quite common, one could challenge the idea whether it is useful for a company to channel their innovation into innovation labs or start-up accelerators or incubators and thus separate innovation from daily business. Two problems may arise from this. First, employees working in the core business may feel disconnected or neglected when it comes to shifting recognition from inside and outside the company to innovative solutions. Second, the communication and information flow between the core business and the innovation business needs to be open, in order to create solutions that are not only state of the art technology but are also directed towards a real world problem. Often, innovation is generated from problems in daily business which indicates that the core business of an organization bears great innovative potential.

In the current discussion on digital transformation, certain activities that successful and disruptive start-ups have used get particular attention as being "success factors", such as design thinking or innovation labs. In a sense, these activities can be seen as cargo cults. The term "cargo cult" refers to the behavior of people or organizations using symbols without properly understanding the underlying meaning (Feynman, 1974). The origin of this terms lies in World War II, when allied forces landed cargo planes in Melanesia and afterwards researchers observed indigenous people who built an airport tower, a landing strip, or an airplane from wood in the hope that this would bring the cargo planes back. In academia, for instance, this term was made popular through Richard Feynman, who applied it to research that is conducted with sufficient rigor, but without recognizing the value, contribution, or relevance of the research. Speaking of cargo cults in the FFE of digital transformation refers to companies copying the activities of other successful companies or start-ups, assuming that this will propel their digitalization, without properly setting the goal and vision for the future and assessing whether these activities contribute to the overarching goal. This behavior is also referred to as "mindless" innovation, where companies adopt innovations without paying attention to their organizational structures (Swanson & Ramiller, 2004), as "innovation theater", or "digital façade*"* (Tumbas, Seidel, Berente, & Brocke, 2015). There is a negative connotation to this term when these procedures act out certain behaviors and send signals to the outside, but do not produce any valuable results. On the other hand, there are also some advantages to this. The first one is that for example the installation of an innovation lab, the ostentatious use of design thinking, or the re-design of the workspace sends encouraging signals to those employees that are laggards in their behaviors but curious to try out new things. Secondly, the metaphor of a façade also implies that while it sends first signal to the outside, at the same time, it provides a protected space where a company can actually build these structures, rules, and agents.

There is certainly an advantage of running an innovation lab next to the core business, since in a closed setting ideas can be explored and experimented with faster without disturbing the usual operations. However, in order to reap the innovative potential from the core business, organizations need to make sure to open up the innovation process for employees that are not part of an innovation department and create processes for their ideas to enter the innovation funnel. To avoid cargo cults, it is essential for organizations to begin with defining the strategic vision and base their innovation activities on an analysis of the context of the organization and its specific objectives.

This shows that the important contribution of the FFE process in digital transformation is creating clarity, since activities of experimentation, analysis, and collaboration indicate different options and help to identify the most suitable path going forward.

5.5 Organizational Aspects of the Fuzzy Front End

Ultimately, the goal of the FFE is to exploit its creative potential, identify the most valuable opportunities, and initiate a more structured transformation process. In new product development, the end of the FFE is called “gate 1”, a term used for the idea screening, where companies decide whether a product idea should enter formal development (R. G. Cooper, 2009). In digital transformation, as a more complex process, it is more difficult to identify and define the step that corresponds to “gate 1”. The following characteristics apply to the end of the FFE in digital transformation:

- Defined process and roadmap with clear goals and KPI instead of open-end experimentation
- Defined budget and financial plan, instead of skunk work or small financial allowances.
- Defined participants with assigned roles, responsibilities, and authorization instead of randomly formed teams.
- Defined deliverables as objectives of the projects instead of open end experimentation.

However, as Cooper noted, the process of the FFE is a funnel not a tunnel, which implies the necessity to kill ideas and project, so not every idea and activity passes gate 1 and gets implemented (R. G. Cooper, 2009). This requires a changed mindset from most incumbent companies in a sense that they have to allow ideas, prototypes, and concepts to be terminated without blaming the initiators. In new product development it is obvious that multiple prototypes have to be created in order to find a viable new concept. This idea and the corresponding mindset are not very well adapted in strategy formation, where managers often expect that defining a strategy is the result of a brainstorming workshop and are hesitant to change direction quickly. This is due to the important difference that strategy formation is about giving direction for decision-making whereas product innovation is part of the implementation. However, the mindset that abandoning ideas or failure are normal parts of the FFE process is an important idea that can be adopted in strategy adoption and the corresponding mindset will help to better handle the fuzzy nature of this process.

Adopting a more open mindset is not an easy task, but it is part of organizational learning which applies on both the individual and the organizational level (Schuchmann & Seufert, 2015). Approaches for cultural transformation include for example reverse mentoring, where junior employees coach more senior and executive personnel e.g. in the usage of digital technologies (Blackshaw, 2014), introducing agile approaches to enable faster and iterative exploration, or leveraging the wisdom of the crowds in "innovation jams" (Vey et al., 2017).

The last contribution (contribution E) of this thesis has also pointed out the relevance of organizational activities, routines, and procedures. Organizational change is not created in the strategy department by defining a vision, but the enacted and built in the daily work of all employees. This understanding of strategy as emergent process is common in strategy research (Mintzberg et al., 1998) but also in recent IS publications (e.g. Chanias and Hess 2016). The activity systems generated through analysis of multiple cases have shown that plenty of stakeholders and organizational formats are involved – some organizations choose to have a dedicated manager, such as a CDO, driving digital transformation, others involve external agents, such as partners or even customers. Strategy formation in the digital age is therefore not the task of a previously defined group but may the participants as well as their activities may be configured depending on the situational context of the organization. Due to the fuzzy and complex nature, it is not possible to find the ideal organizational set-up, but organizations need to prepare different alternatives that they can draw on, depending on the specific challenges at hand.

This perspective of strategizing as process (G. Johnson, Melin, & Whittington, 2003), that is enacted through organizational routines by various stakeholders goes in accordance with the initial argument in this chapter of continuous change, and stresses the continuous instances of FFE phases in digital transformation. The variety of activities is more extensive than in product innovation, since it does not only encompass activities that are expected, usual, and familiar tasks of the innovation team, but it includes activities in IT, strategy, HR, marketing, and others, and furthermore, it includes stakeholders from different business units and heterogeneous backgrounds.

The cultural change, organizational learning, and variety of organizational activities during the FFE of digital transformation facilitate the innovative potential in this phase and create new knowledge that the organization can build on while continuing in the transformation journey.

5.6 Integration

The transfer of the FFE from product innovation literature to this setting of organizational transformation has shown a range of counterintuitive facets discussed in this chapter. In this integration, I highlight those diversions from the characteristics of FFE to explain the differences in application of this theory.

In product innovation, the FFE describes the first phase of an overall contained process. In organizational transformation, however, it appears to assume the role of a recurring phase of optimistic, entrepreneurial uncertainty that holds the potential of generating new business opportunity. As the number of different opportunities for transformation in organizations is hardly limited, the FFE can range from a specific phase of a strategic change process to an unspecific, constant state of managerial mindfulness and assumption of unlocking further business potential.

In product innovation, the FFE describes the first phase of a process that intends to generate innovation. In organizational transformation, however, managers in this phase of a change process are also tasked to analyze and decide what exactly needs innovation, to which degree, and how this innovation will impact on other facets of the business model. As the degree to which organizational transformation remodels interconnected systems is commonly far greater than that of product innovation, this task of identifying how far transformation should be pushed forward, is critical.

In product innovation, the FFE describes the first phase of a process that intends to produce measurable advancement. In organizational transformation, measurement of digitalization is possible – but the interpretation of the measurement result depends on market context and strategic positioning. Consequently, the evaluation of a successful digital transformation process is likely not constant and needs to grow and adapt with the advancement of the project.

In product innovation, the FFE describes the first phase of innovating an organizations' product. In organizational transformation, this process means changing the identity of the organization itself. This entails that in the FFE of digital transformation the implications of this change process for all stakeholders need to be considered. While most employees can understand and support a new product, they will find it more difficult to get behind a changed organizational identity that they may have not had a chance to co-develop.

In product innovation, the FFE describes the first phase of an experienced product development team conducting their routine task: developing a product from scratch to

the first stage of conceptualization. In case of organizational transformations, this phase is neither as clearly defined nor is it being steered by managers as most transformation processes are spearheaded by task forces or one-off project teams. Consequentially, the FFE of transformation is likely even fuzzier than that in the original domain of product innovation.

These different perspectives show that the FFE of digital transformation is a broad topic that encompasses aspects on multiple levels and involves multiple stakeholders. The characteristics and challenges of the FFE that are further explored in the different research projects of this dissertation and that have been discussed here contain complementary but also competing aspects. In order to be able to absorb new knowledge from the outside and create innovation it is necessary to challenge the dominant logic, in order to allow new truly innovative ideas to be created. However, when moving into a more analytical phase, a frame of reference is needed that new ideas can be assessed against. Exploring new ideas and experimenting with them requires an open and interconnected organizational culture, while the organization also benefits from heterogeneous backgrounds. In digital transformation, it is key to not only balance these different perspectives – analytical and creative – but to combine both in an advantageous way.

6 Conclusion

In this dissertation, I apply the concept of the fuzzy front end (FFE) to digital transformation and explores different organizational procedures in strategy formation, such as experimenting, analyzing, and collaborative organizational activities. The thesis consists of five separate publications and an introductory article explaining the topic, underlying theory, and contributions of the thesis. The overall objective of this research is to create value for practitioners by giving them both tools and inspiration to better tackle practical challenges, as well as for academia by adding to the body of knowledge in the field of digital transformation by combining the perspectives of organizational change strategy and the FFE of organizational innovation. The findings of this thesis consist of an introductory literature review exploring the prior research on strategy formation in different domains, a description of a typical case of exploration of innovative technology, the design of a digital maturity model and the derivation of digital transformation stages based on a survey among 547 participants, and finally, the delineation of typical activity systems and approaches from eleven case examples.

6.1 Implications for Practice

The results of this thesis support practitioners when setting up a digital transformation program for their organization in several ways.

First, the findings of my research imply that adjustments to the dominant logic are required to facilitate the organization's self-innovation process: for a successful FFE in digital business transformation, managers ought to revise and potentially align their beliefs, assumptions, and ideas about the role and function of the transformation process. My research shows that managers find navigating the FFE of digital transformation difficult, because of the cognitive challenge to realize that there is a need to take action. Any transformation that is meaningfully changing an organization requires to re-define these beliefs, assumptions, and ideas to allow new ways of thinking. This new way of thinking challenges previous paradigms. Consequentially, digital transformation requires new strategic instruments and this, in turn, entails changing the dominant logic. In practice, the dominant logic can be compared to a mental "filter" for new ideas in the FFE. As a solution, my research suggests that while managers might find the initial steps demanding, chaotic, and confusing, through a better description of this phase they become aware of the need of different measures that are part of the organizational repertoire in this phase to improve the subsequent program. Specifically, my research implies

that while managers structure the assumed chaos of early transformative stages, they can harness the creative potential that is reaped through experimenting and collaborating. Techniques that can be used for this are e.g. scenario planning in order to ideate possible development paths for the organization and improve organizational learning (Balarezo & Nielsen, 2017). In conclusion, this first implication is building on my contribution of a better understanding of the FFE phase and the importance of sensemaking.

Second, the findings of my research imply that the scope of digital transformation must extend beyond creating a digital transformation strategy: managers initiating or steering a transformation process ought to embed their transformation strategy in the overall business strategy and reflect against the market context. The findings of contribution C and D show that digitization affects multiple dimensions within the organization not only the corporate strategy. In addition to this, digitization itself is not the solution to a flawed business strategy but opens up new possibilities for value creation and serves as means to achieve a company's objectives. In particular, the findings of contribution D show that companies start their digital transformation program by building on already existing capabilities and in a later stage open up their organization to e.g. to include partners and customers in organization processes. As a solution, my research suggest that managers begin with defining the overarching vision and objectives based on their specific context but also challenge their previous assumptions. The digital maturity model, specifically, is an instrument to explore and compare the understanding of digital transformation, but also to detect conflicting opinions or misunderstandings in the perception of digital transformation within the organization. This model as well as comparable instruments assist organizations during the analysis and planning stages of the FFE, when organizations assess both external opportunities and internal capabilities in order to design their strategy accordingly.

Third, the findings of this thesis imply that initiating a digital transformation program does not only have a procedural, but also a structural component and that there are multiple ways of organizing the transformation: managers entrusted with directing a transformation process ought to consider the opportunities and disadvantages that reside in different organizational structures with regard to transformation in order to adjust their approaches to implementation. My research, particularly contribution E, shows that the different activities in the FFE of digital transformation involve different actors that have not been part of the strategy development teams before. As a solution, I suggest that managers take advantage of including multiple stakeholders and activities that enact the

strategic transformation vision. Specifically, managers should make sure to communicate the strategic vision well within the organization, select the strategic path and the corresponding activities based on the strategic context of an organization and the individual situation. In order to cope with continuous change, managers need to develop and foster dynamic capabilities in their organizations. Technological and behavioral developments in the digital age cannot be predicted, however, an organization with dynamic capabilities (D. J. Teece, Pisano, & Shuen, 1997) is enabled to anticipate change and take respective action and thus create a more successful response to disruptive change (Karimi & Walter, 2015). The findings of this thesis have also highlighted the importance of heterogeneous knowledge in this collaborative stage that increases the resources that an organization can draw from. In conclusion this third implication stresses the importance of including organizational considerations in the strategy process.

Conversations with practitioners in this field have shown that often there is the need for a framework or model that helps them organize the digital transformation program. I suggest, that there is not the need to build new frameworks, but rather to combine the existing knowledge from multiple domains on topics related to digital transformation e.g. sensemaking, absorptive capacity, or dynamic capabilities and map this knowledge to the specific challenges in digital transformation in order to creating new answers through re-combination of different aspects.

6.2 Implications for Theory

Besides contributing results that solve relevant practical problems, this dissertation also adds to the existing body of knowledge from an academic point of view and be of use for other researchers to build on. This thesis also contributes to the research stream on digital transformation strategy formation in various ways:

First, this thesis provides a comprehensive description of initial phase in digital transformation strategy formation. The field of digital transformation strategies is new and research that is directed towards how companies actually approach the formation of a transformation strategy is scarce. Therefore, providing more insight into the characteristics, activities and approaches in the front end stage is a viable ground for further research on the antecedents, characteristics, and consequences of digital transformation. As a next step, research questions on causal relationships and impacts of different factors in digital transformation are of interest. This explanatory research starts with detailed knowledge on the research area which is provided in this thesis.

Second, the use of activity theory to explore the activities in the front end of digital transformation has proven to be of great use to observe the implementation of strategy in organizational change. This confirms prior studies that use an activity-based view to explore the strategizing process on a micro-level (G. Johnson et al., 2003). Instead of focusing on single factors within digital transformation, activity theory helps researchers to take on a more systemic perspective, which is valuable to explore the relationships between different stakeholders and activities in this complex process. We know from systems thinking that the whole of digital transformation is greater than the sum of its various activities, therefore I would encourage further research to explore the effects of impacts of the various activities on the whole system of digital transformation.

Third, this thesis takes a new approach and extends the concept of the FFE outside of the new product development domain. Research in innovation has demonstrated, that the FFE is an important phase in this process and improving the initial stage has an impact on the entire process. In digital transformation, we see the same characteristics in the beginning of the process, however, research that is specifically directed to improving this phase is scarce. Therefore, the extension of the FFE outside the product innovation domain is a valuable foundation for other researchers to build on. In particular, explaining cognitive boundaries of individuals of different organizational levels during the sensemaking process and while collaborating would be of interest to better understand the FFE of digital transformation.

6.3 Limitations

While the results of this thesis contribute to a better understanding and management of the FFE of digital transformation, it is not without limitations. For each contribution, the specific limitations are stated in each article, therefore, the limitations here refer to overarching characteristics.

First, the digital maturity model and the corresponding criteria catalogue that were developed in this thesis (contribution C and D) have some restrictions. The instrument was deliberately developed that it can be applied across various industries. Thus, the instrument does not provide any industry specific insights. Also, while being carefully developed through literature review and several focus groups, a proper evaluation of the instrument following the design science research process has not been in scope, which would be mandatory if the instrument is being used as measurement instrument. Results

are based on a self-assessment of the participants and corresponding biases have to be taken into account.

Second, the data for the case examples were partially collected from award application material, which contain a retrospective view onto the transformation. Apart from one case example, where there was data from multiple years 2015 and 2016 was available, in all other cases the material was collected at a single point in time. This proved to be valuable for its reflective nature. However, to get a complete view on the transformation process I would recommend future research to take a longitudinal approach to explore the causal chain of events, activities, and strategic decisions that contribute to the FFE.

6.4 Outlook

The research area of digital transformation strategies is very broad and due to the urgent nature of the topic and the practical relevance, a fertile field for further research. In light of the sizeable dimensions of the field, this thesis can only contribute a small part of insight, but the results provide detailed and actionable insight as well as they open up new opportunities for further research.

The first opportunity is to take the external context of an organization into account. Organizational change is often triggered and influenced by external stimuli, such as new technologies or activities of direct competitors. Being aware of the environmental context may increase the likelihood of organizational transformation (Lant, Milliken, & Batra, 1992) or – in case of environmental turbulence – managers may decide to postpone strategic change (Karim, Carroll, & Long, 2016). In digital transformation, there are also strong influences from outside the own industry or from a digital ecosystem, where companies are connected through a common interest rather than being part of the same industry (Selander, Henfridsson, & Svahn, 2013). Organizations take on approaches, technologies, and processes from other industries. Anecdotal evidence shows that is makes a difference whether an organization is under pressure by a shrinking market share, diminishing margins, or new competitors, or whether it can initiate its transformation from a position of power. Therefore, it would be an interesting opportunity to explore these contextual factors and how the influence the transformation process.

Second, it would be valuable to explore the network dynamics in digital transformation. Organizations increasingly form ecosystems with partners in order to gain access to new knowledge or technologies and co-create innovation (Pilinkienė & Mačiulis,

2014; Smorodinskaya, Russell, & Katukov, 2017). This even includes solutions or partners from outside the own industry. Companies participate in these ecosystems to different degrees, some are at the center, e.g. by providing a platform and inviting other companies to contribute, others are participating to a lesser degree (Selander et al., 2013). In digital ecosystems companies adapt practices, standards, or knowledge from other organizations in the network (Perez-Aleman, 2010). Knowing more about what factors influence both knowledge formation as well as innovation diffusion in these networks would be of great practical and theoretical value.

Third, there is a promising research opportunity in further exploring the relationships between the activities, approaches, and stakeholders in the FFE and the outcome or performance in the implementation of the digital transformation process. When observing the relationships between different activities, the notion of "clusters" can help to identify activities and routines that contribute to a common goal (Kremser & Schreyögg, 2016). This would be a useful perspective when researching how the different activities relate to each other on multiple levels. It would be of great use to understand what kind of activities impact the subsequent process positively, such as breaking up organizational silos increasing the innovation activities. Another interesting research project would be whether these factors vary between different industries.

Organizational transformation, whether it is being induced by changing external conditions or intrinsically motivated, whether it is slowly progressing or radically changing, has always been an important part of the lives of individuals, organizations, industries, and society as a whole. The outcome of change will never be predictable from the beginning on. However, it is important that the digital transformation is perceived not as a threat to organizations, but as an opportunity to improve, create value, and enable human potential. Therefore, I hope that this dissertation may contribute to a more thorough understanding of the FFE of digital transformation and enable businesses to use this critical stage to their advantage and to drive successful transformation processes.

II. Part 2

A. The Fuzzy Front End of Digital Transformation

Title	The Fuzzy Front End of Digital Transformation: Three Perspectives on the Formulation of Organizational Change Strategies
Authors	Sabine Berghaus
Year	2016
Conference Proceedings	29th Bled eConference
Ranking	Unranked (VHB Jourqual)
Status	Published

Table 1: Overview contribution A

The fuzzy front-end describes the random and generally vague initial stages of an innovation project. Since digital transformation can be seen as innovation process of an organization, improving the initial stages can be beneficial for the entire process. This literature review takes the unique perspective of the fuzzy front-end within digital transformation. Characteristics of and challenges in formulating of organizational change strategies are reviewed in three different domains: information systems (IS), management & strategy (MS), and organization science (OS). The results show that within IS, the role of information systems has changed from a process-oriented to a more strategic role and digital technology skills become more important during strategy formulation. Within MS, there is a strong focus on interpreting external signals and reacting to them. In OS, the formulation of a change strategy is seen as a collaborative process between leadership and the workforce. The results from this review should encourage the research on digital transformation to focus to a greater extent on the initial phase of strategy formulation.

1 Introduction

In new product development, the initial phase of idea creation before the formal initiation of an innovation project is known as the fuzzy front-end (FFE) (P. G. Smith & Reinertsen, 1991). It is typical of the front-end stages of an innovation project, that the outcome is not clearly defined, there is no common vision, and there are various possible courses of action (Rhea, 2003). Yet, the initial phase is essential for several reasons. Firstly, it has often been shown that poor planning at the beginning results in more difficulties during the execution of the project and a less successful outcome (P. G. Smith & Reinertsen, 1991). Secondly, investing in research activities at the start of a project could lead to more significant innovations being created, rather than relying on the emergence of incremental innovations during the course of the project (Rhea, 2003). Ultimately, a greater consideration of the front-end instead of the execution phases can leverage the overall project success (Verworn, 2009).

A considerable body of research is available on strategies for improving the fuzzy font-end within the new product development domain (Alam, 2006; Koen et al., 2002; Reid & de Brentani, 2004; Rhea, 2003). However, to the best of our knowledge this concept has not yet been applied to organizational change processes that can be understood as innovation processes for an entire organization.

Digital business transformation is currently an important challenge for managers designing change towards the digital age (Matt et al., 2015). In this present paper, the term *digital business transformation* is defined as transformation at the organizational level that is disruptive, rather than a continuous learning process. It simultaneously affects multiple areas within the organization and requires a re-definition of the corporate strategy. The dynamic development of digital technologies means that an understanding of digital technology and its applications is no longer a task of the IT or digital business department alone (Horlacher & Hess, 2016; Reynolds & Yetton, 2015). Rather, it needs to be an integral part of corporate strategy (Drnevich & Croson, 2013). Sensing relevant digital innovations, creating an understanding of the impact of digital technologies, and formulating a new strategy for the digital age are important and pressing topics for managers (Carlo, Lyytinen, & Rose, 2012). However, the activities and outcome of digital business transformation are largely unclear and fuzzy. Many decision makers sense technological changes and the resulting competitive context shifts which can potentially have a profound impact on their organizations, but it is not yet clear, how they should prepare and what steps are needed in order to respond appropriately to these threats.

In order to better understand this front-end phase of digital business transformation, this paper takes the unique perspective of the fuzzy front-end within organizational change processes. Digital business transformation is a topic that is being worked on within different disciplines. The research objective is to explore whether and to what extent the front-end stages of organizational change processes are considered within information systems (IS), organization science (OS) and management and strategy (MS). The aim of this literature review is to systematically analyze the current knowledge on the front-end of organizational transformation processes in different disciplines, in order to better understand the phenomenon and inspire a body of knowledge on digital business transformation. The guiding research questions for this paper are: *To what extent is the FFE phase considered in the IS, OS, and MS fields? What are the important characteristics and challenges within the FFE of digital business transformation within the IS, OS and MS fields?*

2 Prior Research: Fuzzy Front-End of Strategy Formulation

In project management, the front-end describes the planning phases before the execution of a project. The front-end stage of a project, be it a new product development or organizational innovation project, is important, because most of the innovation is created during these stages (Rhea, 2003). However, this phase may also be seen as the beginning of a betting process. Only at the end will the participants be able to place the bet on a certain option, which during the process has been regarded as the most promising (Reinertsen, 1999). The term “fuzzy front-end” (FFE) describes the initial phase of innovation activity in the development of new products. The fuzzy front-end is the precursor of the actual new product development project and covers the stages from idea generation until the start of the formal project. During this phase, the outcome is unclear and the fuzzy front-end is often perceived as ill-defined, random and mysterious (Rhea, 2003; P. G. Smith & Reinertsen, 1991). In the product innovation domain, the concept of the fuzzy front-end is of great interest for researchers, since these very early stages provide an excellent opportunity for improving the overall innovation process (Verworn, 2009) and lead to competitive advantages (Reid & de Brentani, 2004). Several activities are part of the fuzzy front-end stage of a project, such as detecting technological development from the environment (de Brentani & Reid, 2012b), or changes in customer interaction (Alam, 2006), assessing the potential, and developing a concept as to how they can be applied to the business (Montoya-Weiss & O’Driscoll, 2000). This phase of the innovation process relies heavily on information flows. A theoretical

model of the structure and process of the FFE identifies the boundary (between organization and environment), gatekeeping (between innovators and decision makers) and project (between decision makers and project managers) as the most relevant interfaces in this process, in order to ensure a sufficient information flow and improve the FFE (de Brentani & Reid, 2012b).

The front-end of strategy processes has been of interest in the literature on information-technology-enabled transformation (ITOT). Besson & Rowe (2012) identify several publications on the "phase of upheaval", as it is referred to in the punctuated equilibrium (PE) model. In contrast to the idea of continuous change, the PE theory argues, that phases of relative stability are followed by phases of rather radical changes, before the organization again returns to a stable state (Romanelli & Tushman, 1994). However, the literature also reveals that the phase of upheaval receives relatively little attention among researchers (Besson & Rowe, 2012), compared to other phases in the strategy process.

Kurt Lewin's three-stage model of change – unfreezing, changing and refreezing – also acknowledges the front-end stage of change within the unfreezing stage. This is when the company recognizes that there is a need to change and starts defining the concept (Lewin, 1963). The phase of unfreezing is also characterized by overcoming defense mechanisms within the organization, as it is necessary to recognize that established ways of thinking may not be appropriate or valuable in the new organizational context. Current patterns of operation cannot be applied, so that this phase is characterized by a certain confusion as to the best way forward (Mintzberg et al., 1998).

Davis et al. (2010) explicitly mention the front-end phase in their strategy model as the visioning phase. This phase comprises activities such as exploring different options for future directions, building a common vision, and risk assessment (E. B. Davis, Kee, & Newcomer, 2010). Within the strategy schools of Mintzberg et al. (1998), the creation of a vision as central part of the strategy formation process is acknowledged within the *entrepreneurial school*. However, within this school, the development of a vision is the task of a single leader, which does not recognize the establishment of a vision as a group effort. This is part of the *learning school*, which states that any informed individual within the organization can contribute to the strategy process (Mintzberg et al., 1998). Since the impact of digital business transformation can be sensed and evaluated in several business units, making sense of technological changes and their impacts on the organization are not the task of a single leader, but of potentially everybody in the organization, which may contribute to the "fuzziness" of the front-end phase.

3 Research Design

Digital transformation is a specific kind of organizational change. In order to determine to what extent the strategy formulation phase is considered in different disciplines, a systematic literature review has been conducted according to the principles of (J Vom Brocke et al., 2009; Webster & Watson, 2002). Three baskets of journals have been compiled for the three disciplines that explore digital business transformation: Information systems (IS), Management & Strategy (MS), and Organization Science (OS). The baskets contain all journals that have been ranked as A+ / A in the "VHB Jourqual 3" ranking. The research was restricted to the top journals, as these are assumed to be representative of the general course of research within each discipline. In total, 39 journals were selected as the database for the literature search.

Basket	**Information Systems**	**Organization Science**	**Management & Strategy**
Search term	"organi?ational change" AND ("strategy formulation") OR ("strategy formation") OR ("strategic planning")	"organi?ational change" AND ("strategy formulation") OR ("strategy formation") OR ("strategic planning")	"organi?ational change" AND ("strategy formulation") OR ("strategy formation") OR ("strategic planning") AND (technology OR digital)
Relevant Results	34	16	62
Time frame of results	1980-2014	1978-2012	1969-2015

Table 2: Documentation of literature search

For the search string, the term "organizational change" was found to provide the best results, since this is the generic term for transformation / change programs. It was combined with the terms "strategy formation" / "strategy formulation" / "strategic planning", in order to identify papers that specifically consider the initial strategy-building phase of the change process. For the MS basket this search term yielded a much larger number of results. Therefore, the terms "digital" OR "technology" were added, in order to restrict this number to specifically technology-induced changes. Conceptual papers with

an exclusively theoretical research were omitted from analysis. Table 2 provides an overview of the search terms used and the results yielded in the respective baskets.

The result lists were exported and coded in Excel. Based on the information given in the title, abstract, and subject terms, the 112 papers were coded according to the scheme depicted in Table 3. The coding scheme for the strategy phases was derived from the phases mentioned in Davis et al. (2010) – vision, planning, and implementation. A fourth code "outcome" was added for publications that consider the results, impact, and effects of a strategy or organizational change process and not the process itself. The coding scheme for the type of change strategy was derived from Mintzberg's types (intended, deliberate, emergent) (Mintzberg & Waters, 1982), which acknowledge that there is both planned and unplanned change. The degree / scope of change was derived from the types of innovation, which acknowledges that there are types of evolutionary and radical change (Norman & Verganti, 2014).

Strategy Phase	**Type of change strategy**
• Vision • Planning • Implementation • Outcome	Intentionality • Intended • Emergent Degree / Scope • Radical / Disruptive • Evolutionary / Continuous

Table 3: Coding scheme for literature review

4 Findings

The retrieved overview of publications shows that the number of publications on organizational change and strategy formulation in A / A+ journals became more popular in the 1990s and has remained steady ever since (see Figure 4). The rising popularity of digital business transformation as a specific type of organizational change cannot be determined purely from the number of publications.

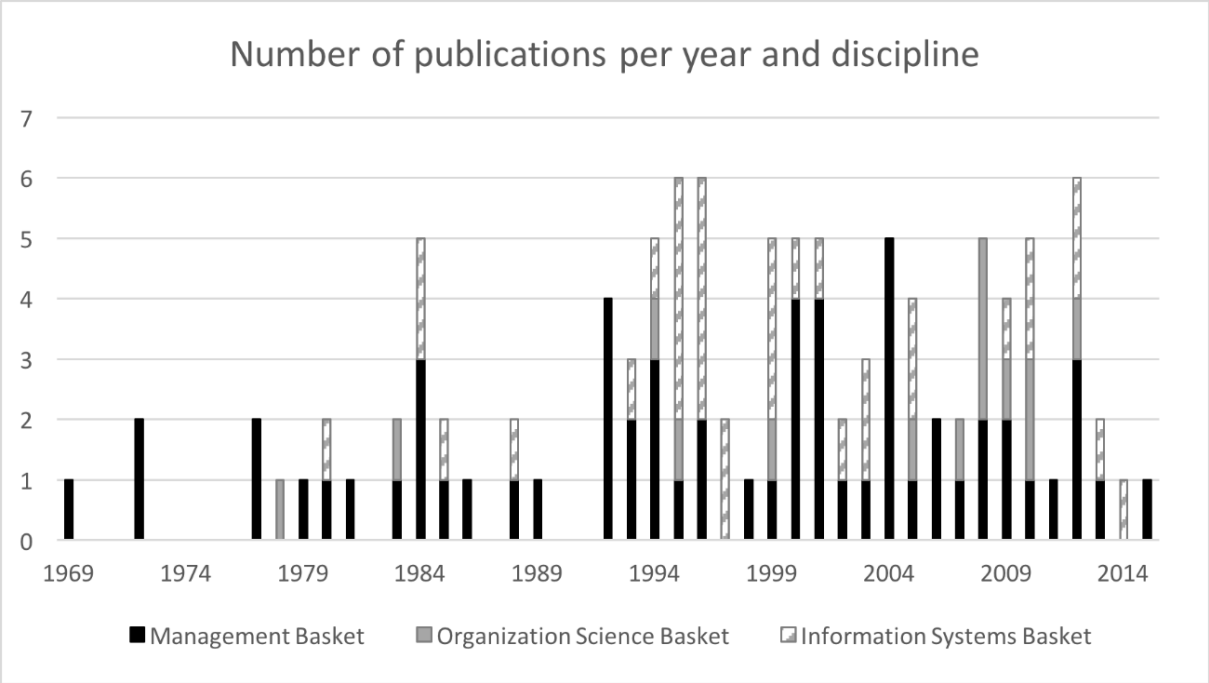

Figure 4: Number of publications on organizational change and strategy formulation in selected journals

The following table shows that the fuzzy front-end of the change strategy, which is the first phase of recognizing the need to initiate an organizational change process and build a common vision receives comparably little research attention. Most publications focus on the planning process and the implementation phase, regardless of the discipline.

	Vision	Planning	Implementation	Outcome
Information Systems	○	▨	●	○
Management & Strategy	▨	●	●	▨
Organization Science	○	▨	●	▨
Legend:	● Frequently covered	▨ Partially covered	○ Barely covered	

Table 4: Analysis per basket of strategy phases considered

Digital business transformation can be seen as a major reorientation for the organization and therefore has an extremely wide scope and a disruptive impact. As can be seen from Table 5, research generally focuses rather on evolutionary changes that might occur more often and are therefore easier to observe. The same challenge probably applies

to emergent strategies that are developed without being intended, but arise as the organization progresses (Mintzberg & Waters, 1982). However, current changes due to the transition into the digital age provide an excellent environment for researching major, more radical organizational changes.

	Intended	Emergent	Radical	Evolutionary
Information Systems	●	●	▨	●
Management & Strategy	●	▨	▨	●
Organization Science	●	▨	○	●
Legend:	● Frequently covered	▨ Partially covered	○ Barely covered	

Table 5: Analysis per basket of change strategy type

4.1 Information Systems (IS) Perspective

Within the IS domain, there is a clear focus on the relationship between information systems and organizational configuration. Therefore, many publications focus on the change process from the perspective of technology implementation, and its effects on organizational processes as well as user behavior, for instance in research on technology adoption (Venkatesh, Morris, Davis, & Davis, 2003).

The guiding research topic is strategic change that is enabled by information technology (Besson & Rowe, 2012; Cha, Hwang, & Gregor, 2015; Cha & Lee, 2013) or the introduction of disruptive digital technologies that force organizations to initiate a major strategic reorientation. As digital technology advances, highly innovative technologies have an impact on the project portfolio and product offerings of organizations. Therefore, there is a broad body of case study research on it-enabled digital transformation (Clemons & Hann, 1999; Harkness, Segars, & Kettinger, 1996; Sarker & Lee, 1999).

Regarding the front-end of transformation strategy, there has been a focus on IS-strategy. IS-strategy formulation is traditionally different from organizational strategic planning, as it focuses strongly on business processes instead of the organizational context (Burn, 1993). However, it has been generally acknowledged that business and IS-strategy should be integrated into a common digital strategy (Bharadwaj et al., 2013;

Drnevich & Croson, 2013; Pagani, 2013). A reason for this is that IT has evolved from its traditional role as a support function into a more strategic role (Henderson & Venkatraman, 1993). This organizational emphasis on IT decisions affects top manager knowledge of IT, which also facilitates business manager participation in strategic IT planning (Bassellier & Benbasat, 2004; Kearns & Sabherwal, 2007). However, in many companies, the IS department lacks formal power to influence the organization's targeted change. Hence, IT executives need to act as change agents in order to gain support from top management (Ngwenyama & Nielsen, 2013; Sharma & Shanks, 2011) and work actively on the positive perception of IT value, so as to achieve consensus (Tallon, 2013). This goes even further than just aligning IT and business goals, requiring collaboration between IT and business departments. Developing a shared mindset between IS and business leaders is a precondition for making IT part of the strategic core (A. M. Hansen, Kraemmergaard, & Mathiassen, 2011; Qu, Oh, & Pinsonneault, 2010).

4.2 Management and Strategy Perspective

Guiding research on strategy formulation for organizational change within the management and strategy domain are the roles of the market, technological and competitive environment (Randolph & Dess, 1984), strategic adaptation, exploitation of market knowledge, and the role of top executives.

Radical change is often initiated as a reaction to a turbulent environment (Lant et al., 1992) that can be caused by technological innovation (Williams, 1983), competitors attacking the core business (Sanchez, 1995) or by market changes and practices that spread in other organizations (Gaba & Meyer, 2008). The changing behavior of customers is also part of the environment. Discovering customer needs and addressing them in the product offering may influence the success of a company (Christensen & Bower, 1996). The development and dynamics of the market, technological, and competitive environment cannot be predicted accurately, which contributes to the fuzziness of the initial phase of a transformation strategy. Therefore, in an unstable environment, companies have to carefully monitor the changes and continuously adjust their strategy. Instead of long-term strategic planning, companies generally prefer smaller steps of action and readjusting, thus incrementally adapting their strategy as they progress (Brown & Eisenhardt, 1997; Kiss & Barr, 2015). Exploiting knowledge on the environment is not only important for strategic planning, but also for the creation of innovative products, which is a key capability of a learning and continuously renewing organization

(Dougherty, 1992). Also, the current strategy may influence future technology, as strategy and technology are intrinsically linked (Itami & Numagami, 1992). Technological innovations are found to have an effect on the scope of the corporate portfolio (Kaul, 2012). Therefore, knowledge of technology can be seen as an important capability in strategy work.

Making sense of industry signals is mostly seen as the task of top management (Williams, 1983), and to be strongly influenced by their belief structures (Kiss & Barr, 2015). While the effect of managerial learning on strategic reorientation is often researched (Lant et al., 1992), other publications stress that exploiting market knowledge for product innovation is not the responsibility of one organizational function, but requires a broader involvement of the workforce and thus a new sense of roles and responsibilities (Dougherty, 1992). The orientation of top management towards change is a key prerequisite for successful innovation (Zmud, 1984) and for knowledge transfer within the organization. Instead of only reacting to the environment, companies may use the first phase of the strategic planning process in order to proactively tackle the reorientation of the company and not only involve top management in this process (Mitroff, Barabba, & Kilmann, 1977).

Recognizing the need to change and to innovate, is only the first part of the strategic planning process. Many companies struggle to react swiftly and take appropriate action in the context of radical innovation. Dealing with organizational inertia is another major research stream within organizational change. One common reason for inertia is that although managers recognize signals from the environment, they fail to build the appropriate organizational capabilities (Tripsas & Gavetti, 2000). In this sense, it is also important to distinguish between radical and incremental innovation, which require quite different strategies (Ettlie et al., 1984).

4.3 Organizational Science Perspective

As can be seen from Table 4, research within the OS domain focuses on the entire change process, and the effects and challenges that occur. Very few publications within the scope of this research deal with the initial planning phases.

Within the OS domain, a stronger research focus on organizational change is directed towards the entire workforce rather than on the top management as responsible for executing the change. An organizational change strategy can also be designed and conducted by a dedicated team that is formed regardless of position and hierarchy (Higgins

et al., 2012). This perspective was often found to be missing within the IS and MS domains. Within the OS perspective, specifically the interplay of managers, leaders, and the workforce is of great interest (Waldman & Javidan, 2009). While top management is still important in terms of leading the process, employees shape organizational routines and behaviors (M. C. Becker & Zirpoli, 2008; Sagie & Koslowsky, 1994) that significantly influence how change processes are conducted. The ubiquity of technology has also led to a democratization of the innovation process, allowing more employees to participate in a distributed and heterogeneous innovation process (Yoo, Boland, Lyytinen, & Majchrzak, 2012).

The current context of change evidently does not play a big role in research, with change usually being seen an evolutionary process, and no publications specifically focusing on radical changes were found.

5 Discussion

The results from the literature review on strategy formulation in organizational change reveal some common elements, but also some differences across the domains.

Within the IS-domain, the perspective of information systems has changed from a solely functional and process-oriented one to a broader strategic role. Therefore, a solid understanding of the dynamic development of digital technologies and its utilization is required within the strategy formulation process. The perspective of the management & strategy domain of the fuzzy front-end is that it is often caused by external changes to which the company needs to react, whereby the top manager is mostly responsible for making sense of industry signals and initiating a viable strategy. However, organizational inertia often hinders the change process. The perspective of the OS domain is that strategy formulation is more a collaborative process than the task of the top executives.

This analysis has shown that the phase of recognizing the need to change, making sense of signals from the environment and initiating a change strategy is partially covered in research. Yet, this initial phase, although extremely important, since it builds the foundation for the implementation of change, receives comparably little attention from researchers. As a result, I propose that applying the concept of the fuzzy front-end (FFE) from the new product development domain into organizational change research can provide a fruitful new avenue for research. In digital transformation, a radical and disruptive change for the organization, a different strategy is needed than for evolutionary or incremental innovations (Ettlie et al., 1984).

The concept of the fuzzy front-end is appropriate for describing the initial phase of digital business transformation, as well as in product innovation, since the main characteristics are quite similar. The process is often perceived as ill-defined, random and mysterious (Rhea, 2003). This also applies to the initiation of a digital transformation strategy, where research is still needed to cover the specific requirements of digital transformation (Matt et al., 2015). In digital transformation and other organizational change processes, the first step is to understand the need for change and develop possible options. Many managers aim at continuous innovation and change within the organization (Brown & Eisenhardt, 1997), but in reality, it can be observed that innovative strategy appears in different cycles of "short sprints", as well as major reorientations (Mintzberg & Waters, 1982). Hence, a promising avenue for further research is to explore and explain patterns and procedures that may reduce the fuzziness and bring more clarity to the front-end stage of the transformation process. One step in improving the fuzzy front-end is understanding and improving the information flow and knowledge transfer, in order to improve the interpretation of external signals and ensure a sufficient information flow between hierarchies. Since this research has revealed that sense-making and information processing are of great importance in organizational change strategies, further contributions might look into how this can be applied to the specific requirements of digital transformation. Another promising field for more research might be to explore the appropriate roles and responsibilities in the fuzzy front-end of digital transformation strategies. In digital transformation, multiple areas of the organization are affected, and therefore, multiple roles and different hierarchies might be involved in this process and in strategy formulation.

6 Conclusion

Although practical experience demonstrates that the beginning of a transformation process is extremely important, this present research has exposed a gap in the body of knowledge on strategy formation. As a limitation, it should be stated that the research only took publications from highly ranked journals into account. While it can be assumed that the top publications are representative of the important topics generally discussed in each this may still lead to a restricted view, so that including more publications from other journals could possibly change the conclusions drawn. A second limitation is that the publications have been assessed based on their abstracts. Depending on the quality and the comprehensiveness of the abstracts, it may be that important information was omitted or that the paper was miscoded. However, hopefully the restriction to highly

ranked publications will mean that in fact the quality of the abstracts is sufficient to correctly code the papers and ensure the soundness of this research.

Drawing on the perspective of the fuzzy front-end, a concept popular in product innovation, this paper has developed new avenues for further research on both organizational transformation and strategy development. Identifying patterns within the FFE may help decision makers to overcome the uncertainties and confusion characterizing this phase and to develop viable strategies for actively designing the transformation process.

B. Requirements Elicitation and Utilization Scenarios for In-Car Use of Wearable Devices

Title	Requirements Elicitation and Utilization Scenarios for In-Car Use of Wearable Devices
Authors	Sabine Berghaus, Andrea Back
Year	2015
Conference Proceedings	48th Hawaii International Conference on System Sciences
Ranking	C (VHB Jourqual)
Status	Published

Table 6: Overview contribution B

With the increasing popularity of wearable technology, companies have been evaluating if wearable devices are relevant to them. In the context of a project in the automotive industry, we set out to assess user requirements for successful application of wearable devices in connection with the vehicle. In order to identify user requirements relevant for our research, we (1) reviewed existing literature to extract requirements already discovered in previous research; (2) we conducted a market analysis in order to gain an overview on functionalities and use cases of current wearable devices; (3) we developed customer journeys as a tool for the focus group and the development of utilization scenarios; (4) we tested our findings in a focus group, and (5) developed five utilization scenarios for in-car use of wearable devices. Results show that key requirements for users are contextual intelligence, making use of sensory input and connectivity, anticipation of user needs, unobtrusiveness, and compatibility with other devices and operating systems.

1 Introduction

Wearable devices are not a recent development, but belong to the concept of ubiquitous computing, a term coined by Mark Weiser in 1988, meaning that technology will increasingly fade into the background and disappear (Weiser, 1991). Wearable technology facilitates a new form of human-computer interaction for being always on and readily accessible (Mann, 1998).

Even though wearable technology is a popular topic in the current discussion, we notice that there are different ideas on the definition of wearable devices. For our research we propose the following definition of wearable technology:

Firstly, as it is evident from the name, one defining feature of wearable devices is that they seamlessly integrate with the user's outfit (Boronowsky, Herzog, Knackfuß, & Lawo, 2005). This characteristic distinguishes them from smartphones: Wearable devices are worn on the body, as opposed to being carried.

Secondly, since devices are worn on the body, they can collect information that usually cannot be accessed in another way, for example measure the user's heart rate, or access data through gyroscope or accelerometer. Wearable devices allow for sensory input (Meng, Choi, & Kim, 2011).

Thirdly, wearable technology does not function solely on its own, but it must be connected and communicate its information to the user, either on a display or via connection to an internet platform. This does not necessarily happen at the time of usage, a connection can also be established after use. Wearable devices are connected.

Lastly we added another characteristic which is important in the specific context of our research. Looking at devices available in the market, we find intelligent devices that fit the characteristics defined, but have been developed for a specific use case only and are only available for a specific, pre-defined target group. Therefore, we exclude devices that serve a highly specialized (e.g. medical or military) purpose only. Which brings us to our last defining characteristic: Wearable devices serve multiple purposes.

Only recently has wearable technology become increasingly popular and moved from niche product to mainstream. More and more devices are entering the market and contain advanced sensors and features. The success of consumer devices in the fitness and wellness sector is having a strong impact on vendors (Zimmermann, Cozza, & Gupta, 2014), with one in 10 US-Americans over 18 years old owning an activity tracker (Ledger & McCaffrey, 2014). The worldwide revenue is said to increase from $1.6bn

this year to $5bn by 2016 (Saran, 2014). According to the Gartner Hype Cycle for Emerging Technologies 2013 (Gartner Press Release, 2013), wearable technology is currently classified at the "Peak of Inflated Expectations". Considering the strong growth in the consumer sector, we expect wearable technology to have an impact on business use cases as well. Recently we have seen business applications of wearable devices in industrial (Osswald, Weiss, & Tscheligi, 2013) and healthcare settings (Meng et al., 2011; Park & Jayaraman, 2003).

In the past years automotive manufacturers have developed various possibilities to connect the mobile phone with the vehicle in order to enhance the driving experience, give information on the vehicle as well as on the surroundings or allow for communication and entertainment. The "connected car" that is linked with the user or external objects and allows for data exchange, communication and new ways of interaction has been a trending topic in the industry for some time (Hines, 2013). Therefore, wearable devices are particularly interesting for the industry, since they interact with users in a more subtle way and can be operated with minimal cognitive effort (Boronowsky et al., 2005). Other trending topics for wearable devices in the automotive industry include gesture control, gaze control or biometric driver identification (Hines, 2013).

This research is based on a project within the automotive industry, conducted between February and May 2014. Our client posed the question, "what role will wearable devices play in the future and in what way they will be important for service design and business models?" Therefore, we set out to explore basic user requirements that wearable devices need to fulfill before specific products and services can be developed. Based on user feedback, we defined possible utilization scenarios for the application of wearable devices in the vehicle. As wearable technology is a rising topic at the moment with no obvious business case and clearly defined use case from our client's side, the initial high-level requirements may serve as an indicator for potential market acceptance of various applications. It is acknowledged that initial requirements of users need to be concretized first – which constitutes the goal level – before defining requirements on a system level and functional level (Berkovich, Leimeister, Hoffmann, & Krcmar, 2012; Gorschek & Wohlin, 2006; van Lamsweerde, 2001). This research may also serve as groundwork for other researchers that investigate concrete requirements for more specific products or services. Since the initial requirements are high-level, we consider the results to be transferable to other industries as well.

We structure this research paper as follows: After stating our research question and describing our research approach in section 2, we summarize the findings in section 3,

following the clusters we identified in the literature review. In section 4 we present the utilization scenarios that we defined from our research. We discuss our results in section 5 and some limitations of our research in section 6. Finally, section 7 covers the conclusion of our research as well as an outlook on possible future work.

2 Research Design

For our automotive study we propose the following guiding question: What are user requirements for wearable technology applications and what are possible scenarios where wearable technology can be used as an added value in connection with the vehicle?

The success of an information system depends to a great part on its fit to the user requirements (Cheng & Atlee, 2007). In order to facilitate user adoption of wearable devices and services that are enabled by wearable technology there needs to be a clear understanding of user needs and constraints. The subject of requirements engineering is concerned with translating real-world observations into a set of specific requirements (Zave, 1997).

Since the aim of this research is not to design a specific service, but to gain a broader view on the potential of wearable devices, we do not apply the full requirements engineering process (Pohl, 2010). Instead, we focus on requirements elicitation (Zowghi & Coulin, 2005) that reveals the needs of stakeholders (Hickey & Davis, 2003). To achieve a valid list as a result, we are combining different methods and not only rely on asking potential users of these systems (Watson & Frolick, 1993).

Also, by combining several research methods we are covering two different perspectives on innovation: technology push, where the innovation comes from the desire to make use of existing technological knowledge, and market pull, where innovation comes from the demand of customer needs (Schuh & Bender, 2012).

2.1 Existing Research

As a first step we conducted a literature review in order to present a representative overview of existing research on user requirements for wearable technology. Defining the scope of the literature review we applied the taxonomy of Cooper (H. M. Cooper, 1988) (Table 7).

We searched for publications that contain the search terms “wearable” and “user requirements”. The search was limited to scholarly and peer-reviewed publications in order to ensure quality of the selected publications. We applied this search string to the following databases in order to achieve exhaustiveness in our research and to cover all top journals: EBSCOhost, AIS electronic library, JSTOR, Emerald Research, IEEEexplore, and SpringerLink. This search yielded 85 results, in total of which twelve publications proved to be relevant to our research objective. We took a concept-centric approach (Webster & Watson, 2002) and extracted all requirements mentioned in these articles and clustered them into groups of similar factors.

Characteristic		**Categorization**
1	Focus	Research outcomes
2	Goal	Integration, Identification of central issues
3	Perspective	Neutral
4	Coverage	Representative
5	Organization	Conceptual
6	Audience	Specialized researchers, general researchers, practitioners

Table 7: Taxonomy of literature review according to Cooper

As a result from this analysis, we will be using the requirement clusters “physical form”, “interaction design”, “functional features” and “intelligence” as guiding categories for our requirements elicitation.

2.2 Market Analysis

We conducted a market analysis in order to gain an overview of devices available in the market, their fields of application and capabilities. This step should allow us to gain insight on the technology-push perspective and assess capabilities of wearable devices available on the market.

As a base for our research we used the database of Vancouver-based consultancy Vandrico (Vandrico Inc, n.d.), which – to our knowledge – provides the most exhaustive overview on current wearable devices, with at that time around 220 devices (Lomas,

2014). Applying our definition of wearable technology, 136 devices remained for analysis. For all devices we gathered information on the following criteria: physical form, connectivity, compatibility, market focus, price, and sensor technology.

2.3 Customer Journeys

As a second step we developed customer journeys based on available material of customers and our own experiences. The customer journey clusters multiple use cases, customer actions, and needs into a scenario (Carroll, 2004). We used these customer journeys in order to identify relevant situations where wearable technology can enhance the driving experience and hence as a structured method to create the utilization scenarios. Furthermore the customer journeys were used in the focus group as a tool to collect insights on current driving behavior as well as to communicate the requirements. In this early and interactive phase of the requirements process, it showed that a higher degree of formality in requirements specification was not required (Yu, 1997). This step shifts our perspective to the market-pull, focusing on demands of the user.

We created three customer journeys for the most critical use cases when interacting with a car. The first was the journey of a family, using a car for their daily activities in a known environment. The second was a business user, who needs a car for business and long-distance travel. The third journey was focusing on vacation by car, so having to drive in an unknown neighborhood. These journeys were signed-off by our client stakeholders. Based on the results of the market analysis and of the customer journey, five scenarios were developed.

2.4 Focus Group

In a third step, we presented and discussed the customer journeys and the scenarios in a focus group. The focus groups have proven to be a valuable method, which allows for gaining rich, in-depth insights into user needs (Billson, 1989; Kontio, Lehtola, & Bragge, 2004) through group-based discussion and reflection (Farinha & Silva, 2013).

We required participants (n=6) to own a car, use a company car or use car-sharing services on a regular basis. Age groups and genders were mixed. For this initial gathering of ideas, participants were required to own a smartphone and use it on a regular basis, since we assumed that rather tech-savvy users would be more interested in giving feedback and it would be easier for them to imagine scenarios where they would use a wearable device.

In a first step the customer journeys were presented and discussed with the participants. The participants were asked to add situations that were difficult for them when driving. At this point we were requiring the participants to reflect on past and current behavior and not think about future use cases. In a second step the initial ideas for utilization scenarios were presented. The participants were asked to criticize these ideas, explain their doubts and consent and add new ideas.

The three-hour discussion was facilitated by an experienced moderator. We used a rough question guideline which outlined the key questions but the exact question technique was subject to the interviewer's facilitation. During the session, all results were collected and clustered on notes on a wall. Thus all items being discussed were visible for all participants. The focus group was also documented by a note taker who collected quotations and emotions from the participants. After the session we took the result clusters that the group agreed on from the notes and complemented them with the codes derived from the detailed session minutes.

3 Findings

This section presents our findings from the different phases of our research summarized in the clusters "physical form", "interaction design", "functional features" and "intelligence" that were deducted from the literature review.

3.1 Physical Form

Regarding the physical form, existing literature states that wearable devices need to allow for hands-free usage, since they are required to be used in a mobile context or while the user is in motion (Baber, Haniff, & Woolley, 1999; Carroll, 2004; Tarasewich, Gong, & Nah, 2007). Also, the design of the hardware should provide for portability, comfort and unobtrusiveness (Park & Jayaraman, 2003; Rosenthal et al., 2011).

The market analysis showed that the prevailing physical form of wearable devices is a wristband or smart watch. More than 60 percent of the devices analyzed belong to this category. This indicates that the wrist is a common position for wearable devices. Therefore it can be assumed that these devices have a higher maturity than others. Our analysis also showed that other physical forms are often used for very specialized devices.

Focus group participants showed a strong preference towards inconspicuously looking devices. However, participants saw great potential in smart glasses, for the ability to

display information within the range of vision and therefore provide an added value over the smartphone:

„Google Glass would be a potential game changer for me, because information is better displayed." (Male user, age 21-30)

Participants also mentioned the importance of the device looking fashionable and being something that can be worn with proud:

"A gadget can also be a status symbol. Like the car key of a Porsche." (Male user, age 31-40).

Summarizing the requirements regarding the physical form of the hardware we state that wearable devices should be unobtrusive and not interfere with the actual task that the user is carrying out. The hardware should have a beautiful and fashionable design, to be socially accepted or enhance the user's status.

3.2 Interaction design

In terms of interaction design, the existing research states that wearable devices need to offer good usability in its interface design and require minimal cognitive load to use (Baber et al., 1999; Bouwman, Faber, & Haaker, 2004; Olsson, Lagerstam, Kärkkäinen, & Väänänen-Vainio-Mattila, 2011; Rosenthal et al., 2011; Rügge, Ruthenbeck, & Scholz-Reiter, 2009). Interaction with the device should not interfere with the original task that the user needs to carry out (Baber et al., 1999).

Users confirmed that it is extremely important that interaction with the devices should not require too much cognitive load. Since wearable devices will be used either in movement or in constantly changing contexts, they need to be controllable even in multitasking situations. One of the users in the focus group observed this in a driving situation:

"I thought when driving I could at the same time dictate my reports to an audio recorder and have my assistant type it afterwards. However, then I noticed that I was always using the same words when I was busy driving and I stopped doing this." (Male user, age 51-60).

Wearable devices have an advantage over the smartphone, since the position on the body allows them to give direct, tactile feedback and they do not rely on the user directly looking on the device.

"Discreet feedback is better than having to pull out your phone every time." (Male user, age 21-30)

Besides these aspects, it also played an important role for users that the device was enjoyable and fun to interact with. This becomes even more relevant in facilitating continuous use of the system.

"I love gadgets, but I usually lose interest quickly." (Female user, 21-30)

Many wearable devices available on the market do not have a display but function in connection with the smartphone. Therefore, we analyzed the connectivity of wearable devices in order to understand how well this works for users. The analysis of connectivity showed that twelve percent of devices are standalone devices, while 45 percent work in connection with the smartphone and 43 percent allow for both standalone and connected functionality. We draw the conclusion that wearable devices that are connected can profit from existing smartphone apps, for example display notifications on the wristband that usually are only visible on the smartphone. Also, users are already familiar with the interaction with a smartphone and therefore do not require getting used to a new system.

However, in the focus group, participants resented changing between different devices within the same usage situation. This requires too much effort and interrupts the user experience.

"For me a wearable solution should be integrated, so I don't need any further interaction." (Male user, age 51-60)

Summarizing the requirements on interaction design, we state that wearable devices should require minimal cognitive load, allow communication through tactile or audio feedback instead or in addition to visual cues, they should be enjoyable and fun to use and allow for both standalone use and connection with a smartphone.

3.3 Functional features

Regarding functional features, the existing literature states that users demand devices to offer some kind of communication functionality or the ability to retrieve information (Carroll, 2004; Gebauer, 2008; Meng et al., 2011; Roy, Scheepers, & Kendall, 2003). Other important factors are good performance and sufficient battery life (Anliker et al., 2004; Rosenthal et al., 2011; Roy et al., 2003).

In terms of functional features, our research focused on the advantage that wearable devices have over smartphones. For the users of the focus group, this was the availability of one or multiple sensors. Sensory input allows the user to collect information that was not available previously. With the wearable device this data can now be used in a variety of use cases, such as preventing accidents, emergency situations or entertainment.

"The wearable device can collect my vital data. For example, it can alert me, when I'm not concentrated while driving." (Female user, age 21-30).

Our market analysis showed that more than 50 percent of wearable devices contain a maximum of two sensors. Sensory input is important, since it allows for innovative use cases. The sensor technologies that are most commonly used in today's wearable devices are accelerometer and gyroscope. Devices can also offer more advanced health sensors, like measuring heart rate, sweat or oxygen saturation.

It also became clear that wearable devices should be compatible to existing operating systems, so users are not required to adapt to different systems and can incorporate wearable devices easily in their existing ecosystems.

Regarding the range of available features, the users showed a strong preference towards multi-purpose devices. Wearable devices with a very limited functionality were assumed to be easier to use, however, users reject the idea of having to carry multiple devices. From today's smartphones, participants are used to the convenience of having one device, which services multiple use cases.

"It could be very important to create an "all-in-one solution". It also should be open for interfaces and several operating systems." (Female user, age 31-40)

We state that in order to be accepted by users, wearable devices should offer sensory input, since users perceive this currently as the key distinctive feature over smartphones. Also, devices should be compatible to other existing operating systems, and aim for multiple purposes.

3.4 Intelligence

Lastly, users require wearable devices to offer some kind of intelligence. In the existing research we found various factors regarding intelligent features, since wearable devices apply to a variety of use situations, and therefore these devices need to provide context-awareness and react to changing situations and usage scenarios (Anliker et al.,

2004; Carroll, 2004; Gebauer, 2008; Olsson et al., 2011; Roy et al., 2003; Tarasewich et al., 2007).

The fact that wearable devices allow for both sensory input and connectivity enables them to interact with the environment. This characteristic is not exclusive for wearable devices, but applies to modern mobile devices as well (Roggen, Perez, Fukumoto, & van Laerhoven, 2014; Sammer, Brechbühl, & Back, 2013). Since wearable devices are used in mobility and in various changing contexts, participants expect that the device reacts to the context and provides respective information.

"I have a very long to-do list. So it would help me to know when I am driving, if there is anything on the way, I can do next. For example drop off my glass garbage around the corner." (Female user, age 51-60)

Also in terms of communication the device should provide the possibility for smart or personalized information. The wearable device is a personal device, which possesses access to a variety of information, such as the user's calendar, location or messages and can therefore offer information based on the personal preferences of the user. Focus group participants mentioned that, for example, when driving, not everybody present in the car should be aware of alerts or notifications.

„SMS should not be read out loud. Do I really want everybody in the car to hear what somebody is texting me?" (Female user, age 31-40)

Therefore the wearable device should be able to communicate in a secretive way or even use codes, which only the owner of the device can interpret.

"Maybe a bracelet that changes color, but only I know what that means." (Female user, age 31-40).

Another requirement for users is that the device needs to push information intelligently and depending on the context, in order to reduce information overload for the user.

„When every bit of information is available for the device, I would need it to be proactive and push information to me." (Female user, age 31-40)

From our experience in the focus group, this capability produced some of the strongest positive reactions among the group. Therefore, we add the requirements of contextual intelligence, personalization and anticipation of user needs for wearable devices.

3.5 Summary of Findings

Our results take into account the various findings from the literature review, the market analysis, the customer journey and the user discussion in our focus group session. We found that the discussion of users was in accordance with the findings from the literature review and market analysis. In summary, we provide the following consolidated list of findings:

	Requirement	Description
Physical form	Unobtrusiveness	Must not interfere with other tasks carried out simultaneously. In an in-car scenario it must not interfere with driving activities. If it is to be used in movement, it should be easily portable allow for hands-free usage.
	Beauty	The device should look fashionable so users enjoy wearing it. It should be enjoyable and fun to use.
Interaction design	Intuition	Interaction with the device should require minimal cognitive load. The device should allow for intuitive input mechanisms, e.g. audio and / or tactile feedback instead / in addition to visual cues.
	Connectivity	The device should be able to be used both in connection with smartphone as well as standalone use. In an in-car scenario the device should be able to connect to the vehicle and access as well as display data.
Functional features	Sensory input	The device should contain one or multiple sensors, which allow for information that the user normally does not have access to.
	Compatibility	The device should use known operating systems and common standards. It should be easy to integrate into an existing device ecosystem.
	Multi-purpose capability	The device must be used in multiple different contexts. It should not only be dedicated to a single purpose.
Intelligence	Contextual intelligence	It should provide intelligent information based on the current context of the user. The information should be displayed according to changing situations. Functionalities should be offered according to the current context.

Personalization	Available information on the user should be used for smart and personalized recommendations. Information should be filtered according to personal preferences.
Anticipation of user needs	Information should rather be pushed to the user than have the user ask for a specific information himself.

Table 8: Consolidated findings

4 Utilization Scenarios

Based on the market analysis and on the customer journeys, the researcher team defined the following scenarios, where wearable devices could be used in connection with the vehicle. These scenarios were presented in the focus group and the participants were asked to critically assess them, add further needs and state whether these were plausible use cases for them. All scenarios were confirmed by the participants of the focus group.

The first scenario is focusing on authenticating the driver through a wearable device in order to open the vehicle. This addresses the pain point of users that car keys are easily lost or hidden. Keyless entry is being used by some manufacturers; however, if the authentication token is worn on the body, it is less likely to be lost. Preferred devices would be a wristband or a smart ring. Besides opening the vehicle, users imagined that it would be convenient to automatically adjust the preferred seat position, and temperature settings.

The second scenario deals with assessing vital information in emergency situations or in order to monitor the physical conditions of the user while driving. Smart devices like wristbands could access the driver's heart rate or body temperature and based on this data release a warning when the driver becomes tired, agitated or too sick to drive a vehicle.

The third scenario describes how wearable devices can be used for interacting with the vehicle interface. As more and more technology is embedded in the vehicle, interaction will be increasingly complex. While in motion the driver should focus on the traffic and not be distracted by in-car systems. Therefore, users imagine that using gestures will be easier than different controls.

The fourth scenario revolves around projecting information as augmented reality within the vehicle. Smart glasses could be used to display navigation information or points of interest within the driver's field of vision while in motion. Also, this could be used to display interaction controls the user can interact with through touch instead of

using the in-car controls. Another example would be a tutorial on how to use in-car controls, which users thought to be useful when driving a new vehicle for the first time, for example a rental car.

As the focus group discussion evolved, we noticed that the users added use cases, where the wearable device would serve as medium to interact with external devices. Therefore, we expanded the predefined set with another scenario. Besides interacting with the car interface, for users it can be also important to interact with connected objects, possibly also through the use of wearable devices. This became evident from the example that "parking" was named by the users as one of the most difficult situations when driving. In this case the users imagined that the wearable device could exchange data with other devices in the city and thus detect, if another driver close by is leaving a parking spot available. This example shows that not only in-car information is important to the user, but also – if not to an even greater extent – external information on the environment, which could be made available through the exchange of data between connected objects, such as wearable devices.

5 Discussion

While the findings show that wearable devices provide some advantages over smartphones and we have seen in our analysis that wearable devices gained a lot of momentum recently, the diffusion has not reached critical mass yet and only early adopters are reached (Rogers, 2003).

According to the Technology Acceptance Model (TAM), variables that facilitate adoption for new technologies are perceived usefulness and perceived ease of use (F. Davis, 1989). Regarding perceived usefulness, we see that multi-purpose usage, openness and expandability and distinctive features compared to other devices can be important drivers for wearable devices. Drivers for the variable perceived ease of use are a platform or operating system, which is familiar to the user, an intuitive interaction design and improved solution on known pain points, such as weak battery life. We assume that devices offering these features will have an advantage in adoption. However, in particular with in-car usage it needs to be considered that ease of use can be a competing factor to security and can facilitate distraction. Therefore, when designing services that are supposed to be used in a safety-relevant context, there needs to be a careful balance between potentially distracting features while still ensuring superior usability.

Currently there are many different players in the market offering a wide range of devices. Looking at global smartphone sales, we see that in the past some market entries have had a disruptive impact on the market, with new players surpassing previously established vendors. The introduction of Android and the following decrease of Symbian and RIM can be stated as an example (Statista, 2014). Therefore, at this point it cannot be predicted which vendors or devices will provide the leading platform for the future. It has also shown that the key success factor is providing more than just a device, but an ecosystem that combines hardware, software and services.

We assume that in the midterm wearable devices will not be able to substitute the smartphone. However, regarding business use cases, there seem to be very specialized use cases where wearable devices can provide a measurable improvement to organizational workflows, for instance in industrial applications or in healthcare (Meng et al., 2011; Osswald et al., 2013; Park & Jayaraman, 2003).

However, even if wearable devices will not take over the mass market, it is obvious that everyday devices will be increasingly connected anytime, anyplace and with anything (Dutton, 2013). Therefore, requirements discovered in this research are also valid for these future "internet of things" applications.

6 Limitations

This research provides a number of interesting insights into user requirements and possible utilization scenarios. Also, we have seen from our literature review that our findings conform to the findings of existing research, which proves their validity. However, our research does not present an exhaustive list of requirements, since the scope of research only covered a limited range of scenarios and the sample of users included in the focus group was reasonably small.

Focus groups with regular users always bear the risk that users cannot imagine use cases and functionalities that they do not know and therefore are not appropriate for idea generation. We mitigated this risk by asking users to explain their current driving behavior, needs and problems. After exploring these customer journeys we then introduced the utilization scenarios built by the researchers based on a review of existing literature and the market analysis. We think that using customer journeys as a frame and getting users to reflect past behavior first, helps them to think about actual needs rather than projecting their potential future behavior.

Therefore we recommend that further research use a combined approach with various qualitative methods in order to validate this list. Since the scenarios we created are solely based on user needs and have not undergone a proof of concept, we expect these findings to have an impact on the development of products or services and thus have our findings validated with testing data of a real prototype. Nevertheless we think that our findings not only apply to wearable devices, but may be transferrable to other connected objects as well and therefore our research forms a valuable contribution for practitioners as well as researchers in this field.

7 Conclusion and Outlook

In this paper we have researched user requirements for wearable devices and how they can be used in connection with the vehicle. In a literature review we identified physical form, interaction design, functionality and intelligence as important categories for requirements. We combined domain knowledge with user insights and conducted a market analysis on available wearable devices, created customer journeys as tool for the ideation phase and validated and expanded our results in a focus group discussion. As a result, we derived a set of user requirements describing desired qualities of wearable devices. Based on the user needs identified, we created utilization scenarios for wearable devices in connection with the vehicle. The scenarios cluster possible use cases for authentication, monitoring physical conditions, interaction with the vehicle, augmented reality and interacting with the environment.

Our future research activities will build on these requirements and validate them with further users in various scenarios. It will also be interesting to see how wearable devices can be used in an enterprise context and whether the same requirements also apply there. We are confident that further research will both confirm and expand our findings.

C. Gestaltungsbereiche der Digitalen Transformation von Unternehmen

Title	Gestaltungsbereiche der Digitalen Transformation von Unternehmen: Entwicklung eines Reifegradmodells
Authors	Sabine Berghaus, Andrea Back
Year	2016
Journal	Die Unternehmung. Swiss Journal for Business Research and Practice
Ranking	C (VHB Jourqual)
Status	Published

Table 9: Overview contribution C

The dynamic proliferation of digital technologies challenges organizations to adapt their business models, products and processes to the new digital reality. The digital transformation of organizations is a disruptive process that decision makers strategically develop and actively carry out. Based on a literature review, qualitative interviews and two focus groups, this study proposes a maturity model that allows a holistic view on the areas affected by digital transformation. The model consists of nine dimensions that consist of a criteria list with 59 indicators. The contribution of this study enables practitioners to assess their activities associated with the digital business transformation and presents further areas of research.

1 Kontext der digitalen Transformation

Die dynamische Entwicklung von neuen digitalen Technologien fordert Unternehmen heraus, ihre Geschäftsmodelle, Produkte und Prozesse an die neue digitale Realität anzupassen (Berman, 2012; A. M. Hansen et al., 2011). Transformationsprozesse von Unternehmen, die durch neue Informationstechnologien (IT) ermöglicht wurden, sind kein neues Thema und wurden in der Vergangenheit breit untersucht. Forschungsobjekte waren dabei beispielsweise der Zusammenhang von IT-Fähigkeiten und Unternehmenserfolg (Bharadwaj, 2000; Chae et al., 2014), der Einfluss von Innovationen von Informationssystemen auf Organisationen (Swanson, 1994), die Entwicklung von organisationalen Fähigkeiten durch IT (Brynjolfsson & Hitt, 2000) oder die gemeinsame Ausrichtung von IT- und Unternehmensstrategie (Chen, Mocker, Preston, & Teubner, 2010; Drnevich & Croson, 2013; Henderson & Venkatraman, 1993).

Unter digitaler Transformation werden Veränderungen in verschiedenen Bereichen wie Technologie, Produkten, Dienstleistungen, Customer Experience, Unternehmensprozessen oder Geschäftsmodellen durch digitale Technologien zusammengefasst (Markides, 2006; Westerman, Calméjane, Bonnet, Ferraris, & McAfee, 2011). Die rapide Entwicklung von digitalen Technologien und daraus resultierende Innovationen haben Unternehmen und ganze Branchen disruptiv verändert (Cravens, Piercy, & Baldauf, 2009; Govindarajan & Kopalle, 2006; Green & Cluley, 2014; Moreau, 2013). Gal et al. (2007) charakterisieren disruptive Innovationen durch drei Merkmale: Erstens heben sie sich deutlich von anderen Alternativen ab. Dies wird darin sichtbar, dass digitale Technologien neue Anwendungsfälle ermöglichen, wie beispielsweise der Einsatz von ortsbezogenen Diensten durch mobile Applikationen (Sammer et al., 2013). Zweitens erfordert ihre Anwendung den Erwerb von neuen Denkmustern. Diese werden erforderlich, da die Allgegenwärtigkeit von Technologie das Nutzerverhalten und die Nutzererwartungen an Produkte und Services ändert (Brenner et al., 2014). Drittens haben sie Einfluss auf zukünftige Innovationen, angrenzende Strukturen und Prozesse. Die allgegenwärtige Nutzung von Webtechnologie ermöglicht die Generierung und Nutzung von mehr Daten, welche wiederum analysiert und eingesetzt werden können, um sowohl das Kundenerlebnis als auch Geschäftsprozesse zu verbessern (S Mithas, Lee, Earley, Murugesan, & Djavanshir, 2013; Sharma, Mithas, & Kankanhalli, 2014). Der Einfluss von digitalen Innovationen auf Prozesse und Strukturen wird im Unternehmenskontext ebenfalls in der veränderten Rolle der CIOs (Weill & Woerner, 2013) sichtbar, die stärker mit Fachbereichen zusammenarbeiten müssen.

2 Reifegradmodelle zur Gestaltung von Transformationsprozessen

Diese Vielzahl von Veränderungen erfordert, dass Unternehmen Strukturen, Prozesse, Produkte und Kultur ganzheitlich transformieren (Österle, 2007) und die daraus resultierende Komplexität bewerkstelligen (Beese, Aier, & Winter, 2015). Das schnelle Tempo der Digitalisierung führt dazu, dass diese Transformation von Unternehmen eher eine radikale Erneuerung als eine schrittweise Verbesserung ist (Bourreau, Gensollen, & Moreau, 2012; Lyytinen & Rose, 2003) und andere Innovationsprozesse gewählt werden als bisher (Henfridsson & Yoo, 2014). Die digitale Transformation ist ein Prozess, den Unternehmen strategisch einleiten und aktiv gestalten (Besson & Rowe, 2012). Zu diesem Zwecke ist es notwendig, dass Entscheider die eigene Organisation sowie die Entwicklungen und das Marktumfeld genau kennen (Tornatzky, Fleischer, & Chakrabarti, 1990) und basierend auf diesem Wissen ein strategisches Ziel und dazu nötige Gestaltungsbereiche für ihre Aktivitäten definieren.

Eine geeignete Methode dazu sind Reifegradmodelle, da sie ermöglichen, den Status quo zu ermitteln (J. Becker et al., 2009) und gleichzeitig einen Entwicklungspfad zu einem möglichen Zielzustand aufzeigen (Pöppelbuß & Röglinger, 2011; Raber, 2013). Damit bieten sie eine Struktur für eine wohlinformierte strategische Unternehmensführung und einen Bezugsrahmen für die Zielsetzung von Transformationsprozessen. Reifegradmodelle skizzieren eine schrittweise und systematische Verbesserung von Fähigkeiten, Prozessen oder Strukturen (Blondiau, Mettler, & Winter, 2013). Ein Reifegradmodell ist also ein Werkzeug für Manager, mit dessen Hilfe ein Bewusstsein für die relevanten Gestaltungsbereiche im Unternehmen geschaffen und ein fortlaufender Entwicklungsprozess strukturiert begleitet werden kann.

Im Bereich Information Systems (IS) existiert bereits eine Vielzahl an Reifegradmodellen. Die Analyse zeigt aber, dass sich bestehende Reifegradmodelle häufig auf einen eng definierten Bereich beziehen (Cleven, Winter, Wortmann, & Mettler, 2014; Mettler, 2010; Neff et al., 2014) und nur wenige Modelle mehrere Unternehmensbereiche berücksichtigen (Albu & Panzar, 2010). Zudem ist es – gerade bei Veränderungsprozessen, die die gesamte Organisation betreffen – wichtig, dass die Mitarbeiterperspektive, die Unternehmenskultur und die Zusammenarbeit nicht vernachlässigt werden, da Veränderungen immer auch ein Prozess der Wissensentwicklung und -weitergabe sind (Margherita & Petti, 2010; Walton, 2014; Zephir, Chapotot, & Minel, 2011). Einige

bestehende Reifegradmodelle von Unternehmensberatungen versuchen den Fokus breiter zu legen (BearingPoint Ltd, 2014; Land, 2014; Lloyds Bank, 2014; Sonntag & Müller, 2013; Steimel, Wichmann, Azhari, Faraby, & Rossmann, 2014; Westerman, Tannou, Bonnet, Ferraris, & McAfee, 2012). Allerdings fehlt bei diesen Modellen häufig die rigorose Dokumentation des methodischen Ansatzes, wie er bei J. Becker et al. (2009) oder De Bruin et al. (2005) gefordert wird.

Daher möchten wir in dieser Studie ermitteln, welche Bereiche eines Unternehmens im Zuge einer digitalen Transformation der Organisation neugestaltet werden müssen und ein Reifegradmodell entwickeln, welches zur Analyse der eigenen Transformationsaktivitäten und als Strukturierungshilfe für die Gestaltung des Digitalisierungsprozesses dienen soll.

3 Konzeptionelle Grundlage

In unserer Studie folgten wir einem explorativen Ansatz, in dem wir uns zwar an bestehenden Modellen orientierten, aber bewusst keine theoretische Grundlage gewählt haben, um auch neue Konzepte zu entdecken und in das Modell einzuschliessen.

Als konzeptionelle Grundlage zur Betrachtung der digitalen Transformation eignen sich mehrere Ansätze. Die Perspektive des „Organizational Learning“ kann angewendet werden, um zu verstehen, wie neues Wissen im Unternehmen generiert und verbreitet wird (Argyris & Schön, 1996; Lyytinen, Rose, & Yoo, 2010). Andere Studien basieren auf dem Ressource-Based-View (RBV) (Barney, 1991) oder Dynamic Capabilities (Eisenhardt & Martin, 2000; D. J. Teece et al., 1997), die davon ausgehen, dass wertvolle, seltene, nicht imitierbare und unersetzbare Ressourcen und Fähigkeiten zum Unternehmenserfolg beitragen. Diese genannten Ansätze fokussieren sich auf interne Fähigkeiten und Abläufe im Unternehmen und sparen die detaillierte Betrachtung von Customer Experience, Produkten und Dienstleistungen aus.

Das Technology-Organization-Environment (TOE) Framework (Tornatzky et al., 1990) berücksichtigt den Kontext von Transformations- und Innovationsentscheidungen in den drei Dimensionen Technologie, Organisation und Marktumfeld. Dieses Framework eignet sich dazu, Treiber zu identifizieren, aber weniger, um den Transformationsprozess des Unternehmens zu betrachten.

Die Disziplin Business Engineering hat die methodische Transformation von Unternehmen des Industriezeitalters in das Informationszeitalter zum Ziel (Baumöl, 2008;

Österle, 1995). Die St.Galler Business-Engineering-Landkarte erlaubt eine systematische Betrachtung der organisationalen Transformation im digitalen Zeitalter. Vier Eigenschaften des Business Engineering waren ausschlaggebend für die Auswahl als Ordnungsrahmen im Rahmen unserer Studie: Erstens fokussiert sich der Ansatz auf Veränderungs- und Erneuerungsprozesse von Unternehmen im Gegensatz zu inkrementellen Weiterentwicklungen im Rahmen des Tagesgeschäfts (Winter, 2011). Zweitens ist Business Engineering sowohl als Verständnis- als auch als Gestaltungsrahmen zu verstehen, welcher die Analyse von Handlungsfeldern und die Ausarbeitung von Massnahmen gleichermassen unterstützt (Winter, 2011). Drittens erlaubt Business Engineering eine ganzheitliche Betrachtungsweise von komplexen, digitalen Transformationsprozessen, da das Modell auf vernetzte Geschäftsarchitekturen abzielt und neben der fachlichen Dimension die Bedeutung von Informationstechnologien in hohem Masse berücksichtigt (Österle & Winter, 2003). Viertens hat die Business-Engineering-Landkarte einen hohen praktischen Anwendungswert, da sie im Dialog mit Praktikern und Wissenschaftlern kontinuierlich weiterentwickelt wird.

Im Rahmen dieser Studie dient uns die Business-Engineering-Landkarte als Ordnungsrahmen, innerhalb dessen wir die Dimensionen herausarbeiten, welche innerhalb der digitalen Transformation wichtige Handlungsfelder darstellen.

Das Kernmodell umfasst die Bereiche Strategie, Prozesse und Informationstechnologie (Österle, 1995; Österle & Winter, 2003). Das neue „St.Galler House of Digital Business“ berücksichtigt neben dem Bereich „Führungsaufgaben“ auch die Dimensionen „Produkt-und Leistungssicht“ sowie „User-, Use-, Utility-Centricity“ als Dach des Modells, um die besondere Bedeutung der veränderten Kundenerwartungen in der neuen digitalen Realität hervorzuheben (Brenner et al., 2014; Leimeister, Österle, & Alter, 2014).

4 Methodisches Vorgehen

Zur Erstellung des Digital Maturity Model dienten die von J. Becker et al. (2009) und De Bruin et al. (2005) beschriebenen Hinweise zur Gestaltung von Reifegradmodellen als Grundlage für unsere Vorgehensweise.

4.1 Literatur Review

Zum Design der Dimensionen, der Reifekriterien und der zugehörigen Messinstrumente wurden insgesamt 70 wissenschaftliche Publikationen zum Thema Digital Business Transformation sowie 16 bestehende vergleichbare Reifegrad-Assessments analysiert. Die wissenschaftlichen Publikationen wurden über eine strukturierte Literatursuche in den Datenbanken EBSCOhost, AISeL, Springer Link, Sciencedirect und Emerald Insight identifiziert, so dass gleichermassen Management- und IS-Publikationen berücksichtigt wurden. In den Datenbanken wurde mit Kombinationen der Suchbegriffe „business transformation“, „enterprise transformation“, „organi?ational transformation“, „organi?ational change“, „digital transformation“, „success factor“ und „maturity model“ gesucht. Die Suche in den Datenbanken war eingeschränkt auf wissenschaftliche Publikationen seit dem Jahr 2005. Die Relevanz der gefundenen Publikationen wurde anhand von Titel und Abstract eingeschätzt. Ausgeschlossen wurden Publikationen, in denen die Digitalisierung ohne Berücksichtigung der Auswirkungen auf den Unternehmenskontext untersucht wurde, die sich auf einen sehr spezifischen Kontext beschränkten (z.B. Digital Government) sowie Publikationen, bei denen explizit spezifische kulturelle Gegebenheiten untersucht wurden.

4.2 Experteninterviews

Die Erkenntnisse aus der Literaturanalyse wurden um die Praxissicht durch Interviews und Fokusgruppen erweitert. An die Teilnehmer aus der Praxis wurden folgende Anforderungen gestellt:

- Mindestens 5 Jahre Berufserfahrung.
- Entscheidungsträger, die das Thema „Digitale Transformation“ in ihren Unternehmen oder als Dienstleister für Anwenderunternehmen operativ verantworten.
- Zusammensetzung aus verschiedenen Branchen.

Zunächst wurden sieben telefonische Experteninterviews anhand eines semistrukturierten Leitfadens durchgeführt, die jeweils ca. 45 Minuten dauerten. Die Interviews wurden aufgezeichnet und anschliessend transkribiert.

Zunächst wurden die Teilnehmer zu ihrem beruflichen Hintergrund und zu ihrer Position befragt, dann zu den Herausforderungen der digitalen Transformation in ihrem Unternehmen und zu Aktivitäten und Erfolgsfaktoren in den Bereichen Strategie, Prozesse, Technologie, Produktinnovation und Kultur und Führung.

4.3 Codierung

Sowohl die in der Literaturschau identifizierten Publikationen als auch die Transkripte der Interviews wurden codiert. Basis für das Coding-Schema waren die Dimensionen des „St.Galler House of Digital Business“ (Leimeister et al., 2014) – „Strategie“, „Prozesse“, „Technologie“, „Leistungssicht“, „User“ und „Kultur“. Mit diesem Schema als Gerüst wurde offen codiert, z.B. „Strategie – Flexibilität“. Die entstandenen Codes wurden danach thematisch zusammengefasst, z.B. im Bereich Kultur wurden die Codes „Know-How“, „Skills“, „Offenheit“, „Digitale Expertise“ zum Cluster „Digitale Expertise“ zusammengefasst, was in einer weiteren Iteration in „Digitale Affinität“ umbenannt wurde, um nicht nur Spezialwissen, sondern auch Breitenwissen damit abzudecken. Auf diese Weise wurden aus den zusammengefassten Codes die Dimensionen und danach die Reifekriterien des Modells konsolidiert. Für den Codierungsprozess wurde die Software Atlas.ti verwendet.

4.4 Fokusgruppen

Die im Codierungsprozess identifizierten Dimensionen wurden in einer Fokusgruppe mit elf Teilnehmern während drei Stunden evaluiert. Die Fokusgruppe wurde anhand eines Leitfadens moderiert und von einem separaten Protokollanten dokumentiert. Die Zwischenergebnisse waren an einer Pinnwand für alle sichtbar.

Zunächst wurden die Dimensionen präsentiert und ein freies Brainstorming zu relevanten Fähigkeiten und Aktivitäten in diesen Bereichen durchgeführt. Danach wurden die aus der Literatur erarbeiteten Kriterien ergänzt und die Unterschiede diskutiert. Anschliessend wurde in eine offene Diskussion übergeleitet.

Im Anschluss an die Fokusgruppe wurde das Modell anhand des Feedbacks überarbeitet und mit der Erstellung der Indikatoren für den Kriterienkatalog begonnen. Im nächsten Schritt waren die Teilnehmer der Fokusgruppe aufgefordert, über ein gemeinsam bearbeitbares Online-Dokument (GoogleDocs) die vorgeschlagenen Indikatoren zu bearbeiten, zu kritisieren oder zu ergänzen.

Das Ergebnis dieser digital geführten Diskussion wurde in einer zweiten Fokusgruppe mit sechs Teilnehmern in einem vierstündigen Workshop besprochen. Dazu wurde der erarbeitete Indikatoren-Pool präsentiert und für jede Dimension des Modells von den Teilnehmern anhand der Evaluationskriterien „Relevanz“, „Vollständigkeit“ und „Verständlichkeit“ beurteilt. Im Anschluss an die Fokusgruppe wurde auf Basis des Feedbacks der finale Kriterienkatalog mit 59 Indikatoren definiert.

4.5 Erstellung des Kriterienkatalogs

Für die Erstellung des Kriterienkatalogs wurden für alle Kriterien bestehende Messinstrumente recherchiert und wo möglich adaptiert.

Tabelle 10 zeigt eine Übersicht über die adaptierten Messinstrumente. Für die übrigen Kriterien wurde analog zum von DeVellis (2003) vorgeschlagenen Vorgehen zunächst ein Indikatoren-Pool entwickelt und daraus der erste Draft des Kriterienkatalogs entwickelt. Die vorgeschlagenen Indikatoren wurden in der zweiten Fokusgruppe als relevant, vollständig und verständlich bewertet. Teilweise wurden die Listen gekürzt, um den Kriterienkatalog übersichtlich zu halten. Der finale Kriterienkatalog wurde ausserdem in einem Pretest mit drei Teilnehmern hinsichtlich Verständlichkeit, Angemessenheit und Konsistenz evaluiert.

Reifekriterium	**Indikatoren adaptiert von:**
Unternehmerische Agilität	(Chakravarty, Grewal, & Sambamurthy, 2013) Entrepreneurial Agility
Flexibles Arbeiten	(Weichbrodt, Josef, Tanner, Schulze, & Degenhardt, 2014) FlexWork Phasenmodell. Ausprägungen der Stufe 5 (Netzwerk- Unternehmen) dienten als Vorlage für die Indikatoren.
Fehlerkultur	(van Dyck, Frese, Baer, & Sonnentag, 2005) Error Management Culture
Performance Measurement	(Quaadgras, Weill, & Ross, 2014) Action-oriented Assessment

Table 10: Adaptierte Messinstrumente

5 Digital Maturity Model

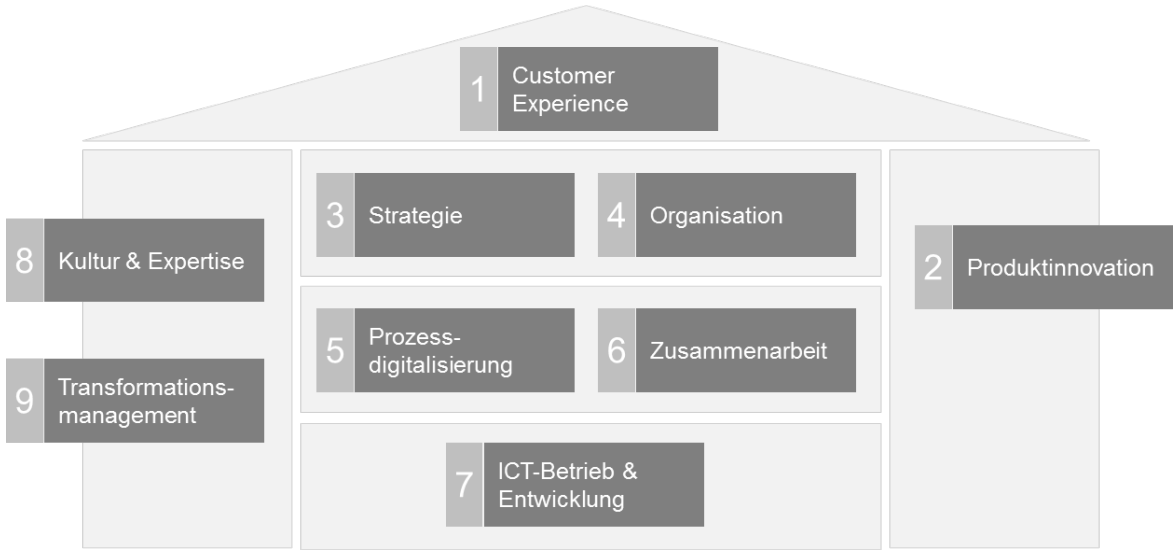

Figure 5: Digital Maturity Model

Die in der Literatur und in den Experteninterviews identifizierten Faktoren wurden in Dimensionen zusammengefasst. Für jede Dimension wurden entsprechende Reifekriterien definiert, welche die Handlungsfelder beschreiben. Handlungsfelder ergeben sich aus identifizierten Aktivitäten, durch die im Zusammenhang mit der Digitalisierung Mehrwerte geschaffen oder neue Möglichkeiten eröffnet werden könnten, aber auch Fähigkeiten und Voraussetzungen in einem Unternehmen. Aktivitäten in diesen Feldern zeigen die Durchdringung der digitalen Reife.

Als finale Dimensionen wurden „Customer Experience“, „Produktinnovation“, „Strategie“, „Organisation“, „Prozessdigitalisierung“, „Zusammenarbeit“, „ICT-Betrieb & -Entwicklung“, „Kultur & Expertise“ und „Transformationsmanagement“ für das Digital Maturity Model identifiziert (siehe Abbildung 5).

Dimension / Reifekriterien	**Literatur-review**	**Experten-interviews**	**Fokus-gruppe 1**
Customer Experience			
Analytics	(✓)	✓	✓
Cross-Channel Experience	(0)	✓	✓
Produktinnovation			
Geschäftsfelderweiterung	✓	✓	✓
Innovationsgrad	✓	(✓)	✓

Digitale Kundenintegration	(✓)	✓	✓
Strategie			
Strategische Innovation	(✓)	✓	✓
Digitales Commitment	✓	(✓)	✓
Organisation			
Digitale Teamaufstellung	(✓)	✓	✓
Unternehmerische Agilität	✓	✓	✓
Partnernetzwerk	✓	✓	✓
Prozessdigitalisierung			
Touchpoint Management	(✓)	(✓)	✓
Automatisierung	✓	✓	✓
Digitale Marketingkommunikation	(0)	(✓)	✓
Zusammenarbeit			
Kollaboration	✓	✓	✓
Wissensmanagement	✓	(✓)	✓
Flexibles Arbeiten	(0)	✓	✓
ICT-Betrieb und Entwicklung			
Agile Projektabwicklung	(✓)	✓	✓
Integrierte Architektur	(✓)	✓	✓
IT-Expertise	✓	✓	✓
Kultur und Expertise			
Digitale Affinität	(✓)	✓	✓
Risikobereitschaft	(0)	✓	✓
Fehlerkultur	(0)	✓	✓
Transformationsmanagement			
Governance	✓	✓	✓

Management-Unterstützung	(✓)	✓	✓
Performance Management	✓	✓	✓
✓ = häufige Nennung	(✓) = vereinzelte Nennung	(0) = nicht genannt	

Table 11: Identifizierte Dimensionen und Reifekriterien in den einzelnen Schritten der Studie

5.1 Customer Experience

Die Kundenbedürfnisse und -erwartungen haben sich durch die Digitalisierung und die Durchdringung von Technologien im Alltag verändert (Brenner et al., 2014). Dies wurde insbesondere auch durch die Interviews mit Experten aus der Praxis deutlich, die dies als einen zentralen Treiber der digitalen Transformation nannten:

"Ich bin der Überzeugung, dass die Kunden nicht mehr auf alte Mechanismen anspringen […] Die Kernkundenbasis wächst immer mehr in die Digital Natives rein und die agieren anders, informieren sich anders, schliessen anders ab." (Director Online, Telekommunikation)

Ein wichtiges Handlungsfeld für Unternehmen ist daher die Fähigkeit, die Nutzerbedürfnisse zu verstehen (Iivari & Iivari, 2011; Liang & Tanniru, 2006) und ihre Angebote auf dieses veränderte Verhalten der Kunden hin auszurichten.

Als erstes Reifekriterium (Analytics) für Unternehmen wurde die Fähigkeit definiert, über digitale Möglichkeiten Kundendaten aus verschiedenen Quellen zusammenzuführen, um Wissen über den Kunden zu generieren und zukünftiges Verhalten zu antizipieren (PwC, 2013; Westerman et al., 2011).

Das zweite Reifekriterium (Cross-Channel Experience) ist die Fähigkeit, die digitalen Angebote auf die Kundenbedürfnisse auszurichten (Chaffey, 2010; Gray, El Sawy, Asper, & Thordarson, 2013; Liang & Tanniru, 2006; Westerman et al., 2011) und mit den Kunden nahtlos über verschiedene Kanäle zu interagieren.

5.2 Produktinnovation

Der hohe Durchdringungsgrad von digitalen Technologien, wie z.B. mobile Endgeräte, oder die Verfügbarkeit von kontextsensitiven Informationen ermöglichen Unternehmen ihr physisches Leistungsangebot mit digitalen Möglichkeiten zu erneuern (Yoo et al., 2010).

Als erstes Reifekriterium (Geschäftsfelderweiterung) wurde die Bereitschaft definiert, dass ein Unternehmen bestehende Produkte und Services mit neuen digitalen Lösungen ergänzt und dadurch relevante digitale Geschäftsfelder oder Ertragsströme (Berman, 2012) erschliesst.

Damit verbunden ist die Fähigkeit zur Innovation und die Entwicklung und Umsetzung von innovativen Ideen (Innovationsgrad) (Berman, 2012; Henfridsson & Yoo, 2014). In den Diskussionen mit Praktikern wurde vor allem die Notwendigkeit hervorgehoben, dass Rahmenbedingungen für ein innovatives Umfeld unter den Mitarbeitern geschaffen werden:

„Wichtig ist, dass Unternehmen eine Ideenplattform abseits von Hierarchien schaffen. Wird das überhaupt im Unternehmen zugelassen?“ (Managing Director, Verwaltung / Schulen)

In einer digitalen Welt wird Innovation in besonderem Masse durch die Einbindung von Kunden oder eine verstärkte Vernetzung der eigenen Mitarbeiter ermöglicht. Offene Strukturen und der Einbezug von Lead-Usern fördern die erfolgreiche Entwicklung von innovativen Ideen (Leimeister, Huber, Bretschneider, & Krcmar, 2009).

„Wir haben […] Focus Days, da kann man an einem Thema arbeiten, das einen interessiert, aber das keinen Projektzusammenhang hat. Da kommen aus allen Bereichen Ideen und […] nach zwei Tagen werden die Ergebnisse präsentiert. Das ist ein kleines Innovation Lab.“ (Leiter Digital Business Applications, Versicherung)

Daher wurde die „Digitale Kundenintegration“ als drittes Reifekriterium für die Dimension Produktinnovation übernommen.

5.3 Strategie

Die strategische Planung digitaler Innovation ist nicht allein Gegenstand in der IT-Strategie, sondern Inhalt einer Fachbereiche und IT-Abteilung übergreifenden digitalen Geschäftsstrategie (Bharadwaj et al., 2013; Drnevich & Croson, 2013).

Als wichtige Voraussetzung für die digitale Transformation wurde „Strategische Innovation“ identifiziert. Dies bedeutet, dass Innovation durch digitale Technologien eine grosse Rolle in der Strategie spielt und aktiv vorangetrieben wird (Yoo et al., 2010). Dies wurde auch durch Aussagen aus den Experteninterviews gestützt:

“Wir investieren jährlich 1,3 Mrd. US Dollar in Weiterentwicklung, es gibt nicht viele Unternehmen, die das stemmen können, […] Es ist wichtig, dass wir die Industrie da

vorantreiben und diese disruptiven Elemente entwickeln.“ (Managing Director, Banken)

Weiterhin wurde von den Experten die zentrale Rolle der IT und digitaler Themen in der Unternehmensstrategie hervorgehoben, was auch durch verschiedene wissenschaftliche Arbeiten gestützt wird (Bharadwaj et al., 2013; Chen et al., 2010; Leidner, Lo, & Preston, 2011; Sunil Mithas, Tafti, & Mitchell, 2013). „Digitales Commitment“ wurde als weiteres Reifekriterium identifiziert.

5.4 Organisation

Die digitale Transformation erfordert auch eine Neuaufstellung in der Organisationsstruktur, um eine grössere Agilität und Flexibilität in der Umsetzung von digitalen Projekten zu gewährleisten.

Das erste identifizierte Reifekriterium ist eine digitale Teamaufstellung. Organisationale Silos sind aufgelöst und digitale Kompetenzen sind in allen Unternehmensbereichen vorhanden. Eine digitale Teamaufstellung zeigt sich beispielsweise darin, dass Fachabteilungen enger mit IT-Abteilungen an digitalen Projekten zusammenarbeiten (A. M. Hansen et al., 2011; Qu et al., 2010). Von den befragten Praktikern wurden in diesem Zusammenhang auch eine stärkere dezentrale Verteilung von Entscheidungskompetenzen und Budget erwähnt:

„Digital Business wird auf einen Nucleus reduziert, das die gesamte Digital Transformation auf strategischer Ebene steuert. Die einzelnen Ressorts haben Kapazitäten und Expertise und dezentrales Budget.“ (Leiter Digitale Transformation, Versicherungen).

Die hohe Dynamik der digitalen Transformation erfordert darüber hinaus eine unternehmerische Agilität. Das Unternehmen besitzt die Fähigkeit, flexibel auf wechselnde Einflüsse von aussen zu reagieren (Chakravarty et al., 2013; Ganguly, Nilchiani, & Farr, 2009; Sambamurthy et al., 2003).

Im Zusammenhang mit einer höheren Flexibilität steigt die Notwendigkeit eines Partnernetzwerks. Für fehlende Fähigkeiten zur Entwicklung von externen Innovationen oder zum Überbrücken von kurzfristigen Engpässen kann ein Unternehmen auf ein Netzwerk aus Spezialdienstleistern zurückgreifen (Frankenberger, Weiblen, & Gassmann, 2013; Grover & Kohli, 2012).

5.5 Prozessdigitalisierung

Im Bereich Prozesse werden digitale Technologien eingesetzt, um interne Prozesse sowie externe Prozesse effizienter zu gestalten und wenn möglich zu automatisieren. Dies ist stark von den Voraussetzungen der jeweiligen Branche abhängig. Für eine branchenübergreifende Betrachtung wurden die folgenden Handlungsfelder identifiziert:

In der externen Kommunikation mit digitalen Kunden, über mehrere Plattformen hinweg, ist es wichtig, dass digitale und mobile Kanäle mit internen Prozessen nahtlos integriert sind (Touchpoint Management) (Chaffey, 2010). Dies geht über die konsistente Gestaltung der Interfaces hinaus, weswegen dieses Kriterium auf der Prozessebene verortet ist.

Damit verbunden ist die Fähigkeit, digitale Massnahmen in der Kommunikation auf Basis von Daten zu steuern und Entscheidungen datenbasiert zu treffen (Digitale Marketingkommunikation).

Ein weiteres Handlungsfeld ist die Automatisierung. Ein Unternehmen schöpft digitale Möglichkeiten aus, um Kernprozesse und Routineprozesse zu vereinfachen und effizienter zu gestalten (Bartel, Ichniowski, & Shaw, 2005).

„Wir arbeiten kontinuierlich daran, dass wir Prozesse zuerst vereinfachen und dann versuchen, zu automatisieren. Wir streben das vor allem in Prozessen an, wo ein Mensch keinen Mehrwert in Richtung Kunde stiften kann und da spielen digitale Möglichkeiten eine grosse Rolle.“ (Leiter Digital Business Applications, Versicherungen).

5.6 Zusammenarbeit

Digitale Technologien können innerhalb des Unternehmens die Kommunikation und Kollaboration der Mitarbeiter verbessern. Auf diese Weise hat die digitale Transformation einen Einfluss auf die Mechanismen in der Zusammenarbeit.

Im Bereich des Wissensmanagements erlauben digitale Technologien in besonderem

Masse, Mitarbeiter aus verschiedenen Unternehmensbereichen miteinander zu vernetzen und so Wissensprozesse zu stärken (Sambamurthy et al., 2003). Dies kann auch dazu genutzt werden, um Innovationsprozesse zu öffnen und externe Ressourcen besser einzubinden (Enkel, Bell, & Hogenkamp, 2011).

Ein weiteres Handlungsfeld ist der Einsatz von digitalen Technologien im Bereich Kollaboration von Teams, z.B. zur Kommunikation und Weitergabe von Informationen.

Dies ist der wachsenden Vernetzung von Teams, z.B. auf globaler Ebene, geschuldet (H. A. Smith & McKeen, 2011).

In diesem Zusammenhang spielt auch die Möglichkeit zu flexiblem Arbeiten eine wichtige Rolle. Durch den Einsatz von digitalen Technologien kann das Unternehmen wechselnde Arbeitsorte und mobiles Arbeiten unterstützen.

Die befragten Praktiker bestätigten dies als wichtiges Handlungsfeld, v.a. in der Vernetzung von Mitarbeitern ohne festen Arbeitsort:

„Der Trend, den wir beobachten, geht mehr aus dem Büro raus zum Arbeiter im Feld – der wird vernetzter, und wir können so Projektmitarbeitende verbinden. Sämtliche Mitarbeitende sollen bis nächstes Jahr mit Smartphones ausgestattet werden." (Leiter Mobile IT, Logistik & Transport)

5.7 ICT-Betrieb und Entwicklung

Auf Ebene der ICT-Systeme werden die Grundlagen für neue digitale Produkte, Dienstleistungen, Kommunikation und Transaktionen gelegt. Hier wurden drei relevante Handlungsfelder identifiziert:

Digitale Projekte werden zunehmend mit agilen Methoden abgewickelt. So können Unternehmen digitale Lösungen schnell in Betrieb nehmen und anpassen. Für Unternehmen bedeutet dies aber auch eine Anpassung der Steuerungsmechanismen und Strukturen in der Projektabwicklung (Aaen, Björesson, & Mathiassen, 2007; Wiklund, Sundmark, Eldh, & Lundqvist, 2013). Auch in den Experteninterviews wurden agile Methoden als entscheidender Erfolgsfaktor in digitalen Projekten genannt:

„Wir arbeiten mit agilen Projektabwicklungsmethoden, wo wir in drei bis vier Wochen ein Delivery machen, ein Produkt liefern können, wo wir schnell Feedback bekommen und wo wir schnell Fehler machen und diese auch schnell korrigieren können." (Leiter Digital Business Applications, Versicherungen)

Um neue digitale Lösungen schnell an bestehende Systeme anzubinden, ist eine skalierbare, integrierte Architektur nötig. Hier spielen Investitionen in die Qualität der IT-Infrastruktur und die Agilität der Backend-Systeme eine wichtige Rolle, um eine entsprechende Flexibilität zu gewährleisten (Chakravarty et al., 2013; Liu, Chen, & Chou, 2011; Sambamurthy et al., 2003).

Darüber hinaus ist ein weiterer wichtiger Handlungsbereich, in der internen IT die Expertise in den für das Unternehmen definierten Schlüsseltechnologien aufzubauen

(Bharadwaj, 2000; Bi, Kam, & Smyrnios, 2011; Chakravarty et al., 2013), um die Fachabteilungen entsprechend beraten zu können oder ggf. externe Dienstleister zu führen.

5.8 Kultur und Expertise

In der Literaturanalyse von Publikationen im Bereich digitale Transformation wurden kulturelle Voraussetzungen nur in geringem Masse genannt (Philip & McKeown, 2004). In den Experteninterviews und der ersten Fokusgruppe wurde dagegen die hohe Bedeutung von kulturellen Rahmenbedingungen in der Organisation hervorgehoben.

Damit die Mitarbeiter die Transformation eines Unternehmens mittragen, ist wichtig, dass diese eine hohe digitale Affinität aufweisen. Dies bedeutet, dass sie nicht nur das für ihre Rolle relevante Spezialwissen, sondern auch ein „Breitenwissen“ zu digitalen Technologien aufweisen und motiviert sind, diese Anwendungen in ihrem Arbeitsalltag zu verwenden (Harris et al., 2012).

Die Teilnehmer aus der Praxis hoben als weitere wichtige kulturelle Voraussetzungen Risikobereitschaft und eine offene Fehlerkultur hervor. Gerade bei sehr innovativen Projekten muss das Unternehmen bereit sein, Risiken einzugehen und bestehende Vorgehensweisen oder Produkte aufzugeben. Damit verbunden ist die Fähigkeit, Fehler offen zu kommunizieren und als Weiterentwicklungsmöglichkeit für das Unternehmen zu begreifen.

„Wie kann ich denn ein «Gamechanging Marketplayer» sein, wenn ich immer die sichere Variante wähle? Ich muss […] eine Kultur haben, die Lust auf Risiken macht und Fehlschläge zelebriert und Wissen daraus generiert.“ (Director Marketing, Telekommunikation)

5.9 Transformationsmanagement

Die digitale Transformation eines Unternehmens ist nicht allein Sache der IT, sondern ein bereichsübergreifendes Veränderungsprojekt. Daher ist eine entsprechende Planung und Steuerung dieses Prozesses nötig.

„Es braucht eine neue Organisationsstruktur, neue Governance. Da reicht es nicht eine Online Unit aufzubauen, da müssen alle an einem Strang ziehen, die brauchen klare Ziele und Guidelines.“ (Leiter Digital Business Transformation, Versicherungen)

Die Dimension Transformationsmanagement wird durch drei Handlungsfelder definiert:

Erstens die Definition einer neuen Governance mit definierten Rollen und Verantwortlichkeiten für alle mit der digitalen Transformation des Unternehmens verbundenen Aktivitäten (Chatterjee & Ravichandran, 2013; Grover & Kohli, 2012; Otto, 2010; Tiwana et al., 2013).

Zweitens ist die Unterstützung des Top Managements entscheidend, das die digitale Transformation des Unternehmens vorantreibt (Jahani, Javadein, & Jafari, 2010) und Ressourcen bereitstellt.

Der dritte Gestaltungsbereich ist das Performance Measurement der Transformation, also die Definition und regelmässige Überprüfung von Zielwerten für entsprechende Aktivitäten (Buchwald, Urbach, & Ahlemann, 2014; Janssen, Moeller, & Schlaefke, 2011; Labusch, Aier, & Winter, 2014).

6 Diskussion der Ergebnisse und der Methodik

6.1 Kritische Würdigung der Anwendung von Reifegradmodellen

Reifegradmodelle sind in der Wirtschaftsinformatik ein häufiges Werkzeug für die Unternehmensentwicklung (J. Becker, Niehaves, Pöppelbuß, & Simons, 2010). In der aktuellen Literatur findet sich aber auch Kritik an der Entwicklungsmethodik und der Anwendung von Reifegradmodellen. In einer Studie von Mullaly (2014) wird die Frage gestellt, ob Reifegradmodelle tatsächlich eine Vorlage für Projekte darstellen können und damit ein strategischer Vorteil für das Unternehmen zu erzielen ist. Wir denken, dass dies im Sinne eines Rahmenwerks durchaus möglich ist, allerdings sind konkrete Handlungsanweisungen von einem solchen Modell nicht abzuleiten. Dies ist vor allem dem Umstand geschuldet, dass das Konzept von „Reife“ schwer zu definieren ist. Reifegradmodelle basieren häufig auf der Annahme, dass der Fortschritt hin zu einem Zielzustand ein linearer Prozess ist und ein vermeintlich reifes Unternehmen auch unternehmerisch besser aufgestellt ist als die Wettbewerber. Die meisten Reifegradmodelle bieten lediglich ein generisches Bezugssystem an, das sich nicht auf alle Projekte innerhalb eines Unternehmens anwenden lässt, da dies bedeuten würde, dass auch sehr individuelle Projekte auf die gleiche Art und Weise geführt werden müssten. Reifegradmodelle sind daher nicht geeignet, um sehr spezifische Probleme zu lösen (Cleven et al., 2014; Mullaly, 2014; Pries-Heje & Baskerville, 2010).

Damit Reifegradmodelle ein nützliches Instrument zur Verbesserung von Transformationsprozessen werden können, müssen sie nicht nur den aktuellen Status des Unternehmens untersuchen (deskriptiv), sondern auch konkrete Schritte aufzeigen, wie die nächste Reifestufe erreicht werden kann, so dass Entscheidungsträger einen Entwicklungspfad definieren können (präskriptiv) (Jahani et al., 2010). In einer Analyse von 10 Reifegradmodellen zeigten Röglinger et al. (2012), dass den Designprinzipien für präskriptive Verwendungen selten entsprochen wird. Daher sind diese Modelle von begrenztem Wert für Unternehmen.

In dieser Studie wurde ein neues Reifegradmodell zur Evaluierung der digitalen Reife von Unternehmen entwickelt. Auch in unserer Untersuchung zeigte sich, dass ein Reifegradmodell in seiner deskriptiven Funktion gut geeignet ist, um den aktuellen Fähigkeitsstand von Unternehmen abzubilden und sich auf diese Weise einzuschätzen. Präskriptive Funktionen, gerade bei einem so komplexen Feld und einem weit gefassten Branchenfokus, sind allerdings in ein solches Modell schwierig zu integrieren. Daher würden wir den präskriptiven Beitrag von Reifegradmodellen ebenfalls eher gering einschätzen. So sollte das Digital Maturity Model nicht als normative Handlungsanweisung verstanden werden, sondern als beschreibendes Element, das durch die Beschäftigung mit den verschiedenen Themengebieten der digitalen Transformation Hilfestellung bei der Gestaltung der individuellen Entwicklungspfade im konkreten situativen Kontext eines Unternehmens gibt.

6.2 Praktischer Beitrag des Digital Maturity Model

Der Kriterienkatalog des Digital Maturity Model stellt für Entscheidungsträger ein Werkzeug in der Analysephase des Managementkreislaufs dar und liefert einen konkreten Beitrag als Standortbestimmung und als gemeinsame Gesprächsgrundlage („Boundary Object“).

Zum einen dient die Beschäftigung mit dem Kriterienkatalog der systematischen Analyse ihrer Veränderungsaktivitäten sowie allfälliger Schwachstellen in ihrem Transformationsprozess. Besonders hervorzuheben ist in diesem Zusammenhang das Aufdecken von Wahrnehmungsdifferenzen innerhalb der Organisation. Wird der Kriterienkatalog von mehreren Personen aus demselben Unternehmen angewendet, gibt dies Aufschluss, welche Bereiche unterschiedlich eingeschätzt werden. Das Digital Maturity Model und die dazugehörige Umfrage dienen also als Standortbestimmung für die digitale Transformation eines Unternehmens.

Zweitens entsteht durch die Reflexion der Situation des Unternehmens ein Verständnis für die unterschiedlichen Auswirkungen der digitalen Transformation. Das Modell und die Beschäftigung mit dem Kriterienkatalog kann also als Grundlage für ein gemeinsames Verständnis („Boundary Object“) der digitalen Transformation dienen (Bechky, 2003; A. P. Spee & Jarzabkowski, 2009) und einen entsprechenden Diskurs im Unternehmen anregen. Ein Teilnehmer der Umfrage formulierte dies so:

„Die Auseinandersetzung mit der Thematik hat uns in vielem, was wir in der Vergangenheit getan haben, bestärkt und hat dieser Perspektive der Unternehmensentwicklung ein Label gegeben.“ (Umfrageteilnehmer, Branche „Verwaltung und Schulen“)

6.3 Weitere Forschungsfelder

Der Fokus dieser Studie liegt in erster Linie auf dem praktischen Beitrag. Dennoch ergeben sich aus dieser Untersuchung weitere Forschungsfelder, um die Mechanismen und die strategische Planung der digitalen Transformation besser zu verstehen.

Zum einen ist die Anwendung und Evaluierung von Reifegradmodellen im Unternehmenskontext ein offenes Forschungsfeld. Der Rahmen dieser Studie ist auf die Entwicklung des Reifegradmodells beschränkt. Weitere Studien können evaluieren, welchen Beitrag, den dieses Modell in der Gestaltung von Transformationsaktivitäten im Unternehmen tatsächlich liefern und wie das Modell verbessert werden kann. Da die Literaturanalyse gezeigt hat, dass die präskriptive Funktion von Reifegradmodellen beschränkt ist, würden diese Erkenntnisse zur Verwendung von Reifegradmodellen im Unternehmenskontext einen wertvollen Beitrag in diesem Forschungsfeld liefern.

Ein weiteres vielversprechendes Forschungsfeld ist die Ergänzung der Reifegraduntersuchung mit Fallstudien. Hier könnte untersucht werden, wie Unternehmen die digitale Transformation als strategisches Programm aufsetzen, in welchen Bereichen priorisiert Aktivitäten geplant werden und welchen Erfolg Unternehmen daraus ziehen. Aus dem Wissen über verschiedene Digitalisierungsstrategien können zum einen unterschiedliche Transformationspfade, zum anderen Erfolgsfaktoren abgeleitet werden (Matt et al., 2015).

6.4 Limitationen der Untersuchung und Fazit

Mit unserer Studie haben wir uns das Ziel gesetzt, die relevanten Gestaltungsbereiche zur Transformation von Unternehmen im digitalen Zeitalter in einem Reifegradmodell zu definieren.

Es ist anzumerken, dass eine finale Evaluierung des Reifegradmodells nötig ist, um dessen Beitrag als Instrument zur Unternehmensentwicklung im Arbeitsalltag konkret bewerten zu können. Da ein grosser Teil der Forschung sich lediglich auf das Design von Reifegradmodellen konzentriert und die Implementierung ausser Acht lässt, wäre ein wertvoller Beitrag zur Reifegradmodellforschung, wie Reifegradmodelle langfristig zum organisationalen Lernprozess beitragen können (Blondiau et al., 2013).

Trotz der genannten Limitation stellt das entwickelte Reifegradmodell eine wertvolle Erkenntnisbasis für weitere Forschungsfelder dar, die durch zusätzliche Studien erweitert werden kann.

Diese Studie liefert auf zwei Ebenen einen Beitrag. Zum einen wurde in einem transparent dokumentierten Prozess ein Reifegradmodell entwickelt, das die Einflussbereiche der digitalen Transformation ganzheitlich abbildet. Zum anderen bietet der entstandene Kriterienkatalog für Praktiker eine Möglichkeit, den eigenen Status quo zu analysieren und digitale Veränderungsprozesse strukturiert anzugehen. Auf diese Weise kann das Digital Maturity Model in Unternehmen konkret den Beitrag leisten, Initiativen zur digitalen Transformation zu bewerten und Anregungen geben, wie der digitale Wandel aktiv zu gestalten ist.

7 Danksagung

Unser Dank gilt Bramwell Kaltenrieder, Managing Partner der Strategieberatung Crosswalk, für die Unterstützung bei der Entwicklung und Durchführung der Studie sowie allen beteiligten Experten in den Interviews und Fokusgruppen.

8 Anhang A

Kriterienkatalog mit allen Dimensionen, Reifekriterien und zugehörigen Indikatoren

	Dimension / Reifekriterium	**Indikatoren**
1	Customer Experience	
CX_1	Analytics	Um die Wirkung der Kanäle auf Kommunikations- und Vertriebsziele zu analysieren, führen wir Kunden- und Interaktionsdaten kanalübergreifend zusammen.
CX_2	Analytics	Die Auswertung grosser Mengen an Kundendaten geschieht automatisiert und in Echtzeit.
CX_3	Experience Design	Angebote und Informationen sind in digitalen Kanälen auf den Kundenkontext abgestimmt (z.B. je nach Situation im Verkaufsprozess).
CX_4	Experience Design	Zentrale Kundenprozesse sind über alle relevanten digitalen und physischen Kanäle abgebildet und der Kunde hat die Kanalwahl.
CX_5	Experience Design	Interaktion und Design sind für den jeweiligen digitalen Kanal optimiert.
2	Produktinnovation	
PI_1	Geschäftsfelder-weiterung	Für Produkte und Dienstleistungen wurden durch digitale Technologien neue Begleitangebote und damit ein Mehrwert für den Kunden geschaffen.
PI_2	Geschäftsfelder-weiterung	In den vergangenen Jahren wurden neue digitale Geschäftsmodelle und -ideen erfolgreich umgesetzt.
PI_3	Innovationsgrad	Für die Entwicklung von innovativen digitalen Produkt-, Service- und Prozessideen wurden strategische Rahmenbedingungen geschaffen.
PI_4	Innovationsgrad	Unsere Mitarbeiter bringen aktiv neue digital getriebene Produktideen ein, die in mehreren Fällen bereits umgesetzt wurden.

PI_5	Digitale Kunden-integration	Die Entwicklung von neuen digital getriebenen Produktideen durch Kunden wird aktiv gefördert.
PI_6	Digitale Kunden-integration	Kunden werden systematisch zu ihrer Zufriedenheit und Verbesserungsvorschlägen für digitale Kanäle befragt.
3	Strategie	
ST_1	Strategische Innovation	Wir werden von Mitbewerbern und Fachkreisen als Treiber von digitalen Innovationen wahrgenommen.
ST_2	Strategische Innovation	Digitale Innovation wird systematisch vorangetrieben, z.B. im Rahmen des jährlichen Strategiereviews.
ST_3	Strategische Innovation	Strategische Optimierungen erfolgen zum grossen Teil datenbasiert.
ST_4	Digitales Commitment	"Digital Business" hat in unserer Gesamtstrategie einen hohen Stellenwert und ist breit kommuniziert.
ST_5	Digitales Commitment	Wir setzen uns aktiv damit auseinander, welche strategischen Ressourcen der Firma auch im digitalen Zeitalter ihren Wert behalten.
ST_6	Digitales Commitment	Digitale Projekte stellen einen grossen Anteil im Projektportfolio dar und werden mit hoher Priorität vorangetrieben.
ST_7	Digitales Commitment	Die digitale Geschäftstransformation ist ein laufendes strategisches Change-Projekt in unserer gesamten Unternehmung.
4	Organisation	
OR_1	Digitale Teamaufstellung	Digitale Projekte werden von Anfang an abteilungs- und funktionsübergreifend organisiert und umgesetzt.
OR_2	Digitale Teamaufstellung	Es gibt eine kanalübergreifende Führung und Verantwortung für Markenführung, Umsatz und Kundenzufriedenheit.

OR_3	Unternehmerische Agilität	Unsere Geschäftsstrategie zielt darauf ab, neue Fähigkeiten aufzubauen, um in vielen denkbaren digitalen Szenarien erfolgreich zu sein.
OR_4	Unternehmerische Agilität	Es existiert eine systematische "Frühwarnung" zur Identifikation neuer Technologien und Geschäftsmodelle mit Relevanz für unser Geschäft.
OR_5	Partnernetzwerk	Es existiert ein Partnernetzwerk mit externen Spezialdienstleistern.
OR_6	Partnernetzwerk	Mit externen Partnern gibt es standardisierte Prozesse in der Zusammenarbeit.
5	Prozessdigitalisierung	
PR_1	Touchpoint Management	Digitale und mobile Kanäle sowie Social-Media-Plattformen sind konsequent in Vertriebs- und Transaktionsprozesse integriert.
PR_2	Touchpoint Management	Für digitale und mobile Touchpoints sind Qualitätsmerkmale und Ziele definiert, die regelmässig überprüft werden.
PR_3	Automatisierung	Kernprozesse der Leistungserstellung werden regelmässig auf Optimierungspotenziale durch digitale Technologien überprüft und unter Berücksichtigung der Wirtschaftlichkeit automatisiert.
PR_4	Automatisierung	Das digitale Potenzial in Kernprozessen ist in Bezug auf aktuelle Best Practices ausgeschöpft, umgesetzt und etabliert.
PR_5	Digitale Marketingkommunikation	Digitale und mobile Kanäle sowie Social-Media-Plattformen sind konsequent in Kommunikations- und Serviceprozesse integriert.
PR_6	Digitale Marketingkommunikation	Digitale Kommunikationsmassnahmen werden auf Basis von Analytics umgesetzt.

PR_7	Digitale Marketingkommunikation	Die Ausgaben für digitale Kommunikation richten sich nach der Mediennutzung der Kunden und dem Leistungsbeitrag des jeweiligen Kanals.
6	Zusammenarbeit	
ZU_1	Kollaboration	Digitale Lösungen zum Informationsaustausch und Zusammenarbeit sind bei uns intern und extern in regem Einsatz (z.B. Jive, Confluence etc.).
ZU_2	Kollaboration	Unified Communication mit Video-Conferencing und Screensharing ist Standard in der internen und externen Kommunikation (z.B. Lync, Skype etc.).
ZU_3	Wissensmanagement	Innovative Umsetzungen werden an Tagungen und Konferenzen vorgestellt mit dem Ziel, Wissen in der Community zu verbreiten.
ZU_4	Wissensmanagement	Für digitale Themen sind interne Experten definiert und wirken sowohl intern als auch extern als Ansprechpartner (z.B. Practice Leads).
ZU_5	Flexibles Arbeiten	Mitarbeitende, für die es sinnvoll ist, haben die Möglichkeit, zuhause und mobil mit vollem Datenzugriff zu arbeiten.
ZU_6	Flexibles Arbeiten	Unser Unternehmen hat viel Erfahrung mit mobilem Arbeiten, so dass kaum formale Regelungen nötig sind.
7	ICT-Betrieb und Entwicklung	
IT_1	Agile Projektabwicklung	Agile Methoden sind in der Projektabwicklung Standard (z.B. Scrum).
IT_2	Agile Projektabwicklung	Wir sind in der Lage, für digitale Lösungen kurzfristig Updates zu machen (mindestens innerhalb von 6 Wochen).
IT_3	Agile Projektabwicklung	Wir können neue digitale Produkte und Services anhand von Prototypen schnell testen und modifizieren.

IT_4	Integrierte Architektur	Wir können neue digitale Angebote über definierte APIs schnell an bestehende interne Systeme anbinden.
IT_5	Integrierte Architektur	Daten zu Angeboten, Kunden und Transaktionen werden zentral und kanalübergreifend geführt.
IT_6	Integrierte Architektur	Unsere IT-Infrastruktur wird regelmässig auf die digitalen Anforderungen hin überprüft und falls nötig zeitnah erneuert.
IT_7	IT-Expertise	Digitale Schlüsseltechnologien für die jeweilige Branche sind definiert und können von unserer internen IT geführt werden.
IT_8	IT-Expertise	Wir haben eine klare Strategie zur Beschaffung oder Implementierung digitaler Schlüsseltechnologien.
8	Kultur und Expertise	
KU_1	Digitale Affinität	Unsere Mitarbeitenden wenden für ihre Aufgaben nützliche digitale Lösungen an.
KU_2	Digitale Affinität	Bei der Rekrutierung von neuen Mitarbeitenden sind die digitalen Fähigkeiten ein wichtiges Auswahlkriterium.
KU_3	Digitale Affinität	Unsere Mitarbeitenden sind mit unseren digitalen Angeboten vertraut und wenden diese selbst an.
KU_4	Risikobereitschaft	Unser Unternehmen ist bereit, eigene Angebote oder Prozesse zu substituieren, wenn es die digitale Transformation erfordert.
KU_5	Risikobereitschaft	Das Ausprobieren von neuen Ideen wird trotz möglichen Scheiterns gefördert.
KU_6	Fehlerkultur	Fehler und Lehren aus gescheiterten Projekten werden nicht verschwiegen, sondern proaktiv kommuniziert.
KU_7	Fehlerkultur	Wir werten gemachte Fehler aus, um unsere Prozesse und Lösungen zu verbessern.

9	Transformationsmanagement	
TR_1	Governance	Wir haben eine digitale Roadmap erarbeitet, die zur digitalen Transformation unseres Unternehmens eingesetzt wird.
TR_2	Governance	Wir haben Rollen, Verantwortlichkeiten und Entscheidungsprozesse für die digitale Transformation definiert.
TR_3	Management-Unterstützung	Geschäftsleitung und Verwaltungsrat erkennen die Wichtigkeit von Digital Business und stellen entsprechende Ressourcen zur Verfügung.
TR_4	Management-Unterstützung	Das mittlere Management erkennt die Wichtigkeit von Digital Business und treibt in hohem Masse die Umsetzung von digitalen Projekten.
TR_5	Management-Unterstützung	Eine bereichsübergreifende Verantwortung für die digitale Transformation ist auf der obersten Führungsebene verankert.
TR_6	Performance Measurement	Leistungsindikatoren in Bezug auf operative Ziele des Digital Business sind in Management-Zielvereinbarungen verankert.
TR_7	Performance Measurement	Die Ziele der digitalen Transformation sind messbar definiert und werden periodisch überprüft.

Table 12: Kriterienkatalog

9 Anhang B

Übersicht über die Teilnehmer der qualitativen Erhebung:

Position	**Branche**	**Erfahrung**	**Teilnahme**
Leiter Digital Business Applications	Versicherungen	k.A.	Telefoninterview
Leiter Mobile IT	Transport / Logistik	k.A.	Telefoninterview

Leiter Digital Business Transformation	Versicherungen	>20 Jahre	Telefoninterview
Director Online	Telekommunikation	>10 Jahre	Telefoninterview
Managing Director AT & CH	Banken	>15 Jahre	Telefoninterview [2]
Business Development Manager	Banken	>10 Jahre	Telefoninterview [2]
Leiter E-Business	Transport / Logistik	>15 Jahre	Telefoninterview
Leiter Marketing	Telekommunikation	>20 Jahre	Fokusgruppe 1
Leiter Business Prozesse	Detailhandel	>20 Jahre	Fokusgruppen 1 / 2
Managing Director	Verwaltung / Schulen	>15 Jahre	Fokusgruppen 1 / 2
Digital Transformation Lead	Transport / Logistik	>20 Jahre	Fokusgruppe 1
Geschäftsführer	Medien / Verlage	>20 Jahre	Fokusgruppen 1 / 2
Head of Online Management	Transport / Logistik	>15 Jahre	Fokusgruppen 1 / 2
Head of IT Strategy	Versicherungen	>10 Jahre	Fokusgruppe 1
Managing Partner	Beratung	>15 Jahre	Fokusgruppen 1 / 2
Innovation Strategist	Banken	>10 Jahre	Fokusgruppe 1
Strategy & Innovation Lead	Optik / Elektronik	>15 Jahre	Fokusgruppen 1 / 2
Leiter Fachbereich	Verwaltung / Schulen	>20 Jahre	Fokusgruppe 1

Table 13: Übersicht über Teilnehmer in Experteninterview und Fokusgruppe

2 Doppelinterview mit zwei Teilnehmern

D. Stages in Digital Business Transformation

Title	Stages in Digital Business Transformation: Results of an Empirical Maturity Study
Authors	Sabine Berghaus, Andrea Back
Year	2016
Conference Proceedings	Tenth Mediterranean Conference on Information Systems (MCIS)
Ranking	Unranked (VHB Jourqual)
Status	Published

Table 14: Overview contribution D

Managers and decision makers face the need to transform their organizational routines to meet the challenges of the digital age. Even though organizational change is not a new topic, many companies struggle to recognize and make sense of the disruptive changes affecting all industries. In order to support the understanding of the phenomenon and the development of a digital transformation strategy, this research derives typical stages in a digital business transformation process from empirical data. The nine dimensions of the digital maturity model (DMM) provide a more profound understanding of the relevant levers to manage in digital transformation. The DMM has been implemented in a survey with 547 individuals of 417 organizations in Switzer-land and Germany. Based on the survey data, we used the Rasch-algorithm and cluster analysis to create five maturity stages. Findings show that while digital affinity and experimenting with digital technology are often preexistent in companies, a strategically planned transformation and usage of advanced data analytics in business processes are less common activities. The results from this study give insights into how activities in digital business transformation are currently tackled and prioritized and contribute to the body of knowledge about organizational transformation.

1 Introduction

Digital transformation is a technology-induced change on many levels in the organization that includes both the exploitation of digital technologies to improve existing processes, and the exploration of digital innovation, which can potentially transform the business model. Digital innovation, which is defined as the re-combination of digital technologies and physical components to create novel digital products (Yoo et al., 2010), can be perceived as potentially threatening to the organization (Abraham & Junglas, 2011; Christensen, 2006). Digital innovation involves transformational changes in strategy, processes, and products and thus requires the company to rethink its organizing logic (Yoo et al., 2010). The growing importance of digital technology for organizations is also reflected in the alignment between IT and business, specifically in the integration of IT-strategy and business strategy in a common digital business strategy (Bharadwaj et al., 2013). While a digital strategy consolidates and aligns the IT- and business-strategy, a digital transformation strategy specifically contains the vision, planning, and implementation of the organizational change process (Matt et al., 2015).

Digital transformation simultaneously affects multiple areas within an organization and there are many stakeholders involved in defining a transformation strategy, e.g., marketing, IT, product development, strategy or HR. All of these groups need to develop a common understanding of the prioritization of digital transformation activities. Furthermore, digital transformation has different effects in different industries. Those with a strong customer orientation and business-to-consumer (B2C) relation may experience the influences of the digital age earlier and with a greater impact than organizations with a prevailing business-to-business (B2B) focus.

The strategic transformation process involves developing a vision, strategic planning and implementation (E. B. Davis et al., 2010). However, as can be seen from the perceived urgency of this topic among practitioners, many decision-makers struggle in coming up with a viable digital transformation strategy. Managers from all industries need to define action items for the “transformation roadmap”, prioritize between different activities, and develop a strategic vision for the digital age. In the course of developing a digital transformation strategy, managers require an instrument that indicates possible areas of action, helps them to make sense of the phenomenon, and serves as a boundary object to communicate goals between the different parties involved (Berghaus & Back, 2016). In order to define a digital transformation strategy, managers need to understand the current state of their organization. Transformation is not a linear process, but there are different possible courses of action. It would be beneficial for managers to

know about the difficulty associated with these different measures, in order to make an informed decision about prioritizing between different steps and to lay the foundation for successful organizational change. Therefore, we need to know more about how companies actually face such a transformation, what makes them successful (Heckmann, Steger, & Dowling, 2015), and how organizations approach their transformation (Hess et al., 2016). A maturity model provides some guidance in this respect, since it gives an overview of the different areas and maps out typical paths of how organizations go about their transformation. The research question for this paper is therefore: What stages can be observed in the process of digital business transformation and what does this tell us about how organizations prioritized different courses of action?

In order to identify the stages within the digital transformation, we chose to design a maturity model, using the dimensions of the digital maturity model (DMM) that were developed in a previous study and adopted a quantitative approach to calculate the maturity stages. The remainder of the paper is organized as follows. Firstly, we present a short overview of the most important concepts in digital transformation, as well as those in the application of maturity models. Secondly, we explain how the data analysis was conducted. Thirdly, we describe the results of our survey and the maturity stages, before lastly discussing these findings and presenting our conclusions.

2 Prior research

Organizational change and technology-induced business transformation have been of great interest for researchers of various disciplines for a long time (Palmer et al., 1957). A multitude of theories, such as Punctuated Equilibrium (Romanelli & Tushman, 1994) or Continuous Change (Brown & Eisenhardt, 1997) are used to support our understanding of change mechanisms. However, the current debate on digital transformation (Berman, 2012) reveals that the changes induced by the simultaneous and dynamic influences of digitization on user behavior, organizations, and industries, constitute a new kind of transformation that provides new challenges (Matt et al., 2015).

2.1 Digital transformation

The term “digital transformation” can be applied to both changes at the industry and organizational level. For the purpose of this paper we refer to organizational changes

only. Digital transformation encompasses both process digitization with a focus on efficiency, and digital innovation with a focus on enhancing existing physical products with digital capabilities (Yoo et al., 2012).

The increasing proliferation of digital technologies has been an important catalyst for organizational transformation in the past decades (Yoo et al., 2012), enabling organizations to exploit new use cases (Matt et al., 2015), integrate digital technologies and business processes (Liu et al., 2011), and potentially facilitate key business improvements (Fitzgerald, Kruschwitz, Bonnet, & Welch, 2013). The term transformation refers to a fundamental change within the organization, which has a major impact on organizational strategy and structures (Kotter, 1995; Matt et al., 2015) and the distribution of power (Wischnevsky & Damanpour, 2006). It therefore requires companies to realign and initiate a change process regarding their internal structures as well as their business models, which is without a doubt a challenging organizational learning process (Schuchmann & Seufert, 2015). Digital transformation is a change process that is actively designed and executed (Besson & Rowe, 2012), and therefore, it is necessary to understand the mechanisms of digitization and establish a common understanding within the company.

2.2 Maturity models

A maturity model consists of dimensions and criteria, which describe the areas of action, and maturity stages that indicate the evolution path towards maturity. Maturity models are a tool that mainly enable an assessment of the status quo (J. Becker et al., 2009) and indicate a potential, anticipated or typical development path to the desired target state (Paulk, Curtis, Chrissis, & Weber, 1993; Pöppelbuß & Röglinger, 2011). Maturity models are used in two ways. In their descriptive functionality, maturity models reveal the dimensions which need to be designed, and in their prescriptive functionality, they enable companies to define courses of action or capabilities needed to reach the desired stage of maturity. Maturity models are a topic of growing interest in IS research (J. Becker et al., 2010). The field of digital transformation is too broad to enable the use of a maturity model in its prescriptive functionality, since evolution paths in digitization are not linear, and it is not clear whether a company at the highest maturity stage actually performs better than its competitors (Mullaly, 2014).

For this study we use the maturity model in its descriptive functionality, in order to show the dimensions (e.g. “product innovation”) with which digital transformation affects the organization and to develop the maturity stages from empirical data, in order to derive a typical transformation path. This path groups activities according to difficulty and should therefore not be understood as linear evolution towards a fixed target state.

3 Research Design

In order to answer our research question, we used the Digital Maturity Model (DMM) from a previous study (Berghaus & Back, 2016) and took an inductive, quantitative approach to calculate the maturity stages (Lahrmann, Marx, Mettler, Winter, & Wortmann, 2011). Instead of defining the maturity stages beforehand, e.g., based on evidence from the literature, this methodology enables us to calculate the stages using the actual response data of participants and, therefore, provides a better description of the actual criteria prioritization. Our research design consists of three steps: (1) developing the dimensions of the DMM through a literature review, expert interviews, and focus groups, (2) an online-survey among 547 individuals, and (3) the data analysis using the Rasch-algorithm and cluster analysis to calculate the maturity stages. We applied descriptive statistics to analyze the maturity score for individual participants, as well as results within the dimensions.

3.1 Dimensions of the DMM

This summary provides a short background on the development of the DMM, which was described comprehensively in a previous study (Berghaus & Back, 2016).The dimensions of the DMM and the corresponding items were developed through literature analysis, interviews and focus groups. In the literature review, we analyzed 70 academic publications on digital business transformation, as well as 16 existing maturity assessments. In addition, we conducted exploratory interviews with seven decision makers and digital transformation leaders. All literature and interview transcripts were open-coded, which resulted in a set of criteria that were clustered into dimensions. The first set of criteria and dimensions was evaluated in a focus group with eleven participants. The final nine dimensions of the DMM are (1) customer experience, (2) product innovation, (3) strategy, (4) organization, (5) process digitization, (6) collaboration, (7) information technology, (8) culture & expertise, and (9) transformation management.

Dimension	Criteria (Item ID)	α
1. Customer Experience (CX)	Experience design (CX1, CX2, CX3, CX4) Analytics (CX5, CX6, CX7)	.88
2. Product Innovation (PI)	Business segment extension (PI1, PI2) Innovation capability (PI3, PI4) Customer integration (PI5, PI6)	.90
3. Strategy (ST)	Strategic innovation (ST1, ST2, ST3) Digital commitment (ST4, ST5, ST6, ST7)	.93
4. Organization (OR)	Digital team set-up (OR1, OR2) Organizational agility (OR3, OR4, OR5) Partner network (OR6, OR7)	.85
5. Process Digitization (PD)	Digital marketing communication (PD1, PD2, PD3) Automation (PD4, PD5) Data-driven business (PD6, PD7)	.89
6. Collaboration (CO)	Teamwork (CO1, CO2) Knowledge management (CO3, CO4) Flexible working (CO5, CO6)	.85
7. Information Technology (IT)	Agile project management (IT1, IT2) Integrated architecture (IT3, IT4) IT-expertise (IT5, IT6)	.88
8. Culture & Expertise (CU)	Digital affinity (CU1, CU2, CU3) Readiness to take risk (CU4, CU5) Error culture / No blame culture (CU6, CU7)	.90
9. Transformation Management (TM)	Governance (TM1, TM2) Performance measurement (TM3, TM4) Management support (TM5, TM6, TM7)	.94

Table 15: Dimensions and corresponding criteria of the DMM

After finalizing the dimensions based on the feedback, an item pool was written up and the first item set collaboratively re-worked by the researchers and the participants

of the first focus group, using an online-document. In a second focus group, the item pool was discussed and evaluated regarding comprehensiveness, relevance, and completeness. Based on the feedback from the focus group, the item set was finalized. After the first implementation of the study in 2015, we updated and revised the item set for this present research. These changes were evaluated in another focus group with seven experts from different Swiss companies. Eligible experts have more than 10 years professional experience, have been more than two years in their current company, are in a position of leadership, and have a good overview of the activities related to digital transformation in their respective companies. The internal consistency of scales was tested using Cronbach's α, in order to ensure the homogeneity of items within the scale (DeVellis, 2003). The analysis showed good values (>.85) for all dimensions (see Table 15).

3.2 Data collection

The 60 items of the DMM were presented in an online-questionnaire. The participants were asked to indicate, on a 5-step Likert-scale, to what degree they agree with the statements, from "0 – do not agree" to "4 – fully agree". An additional option "I don't know" was provided. The questionnaire was publicly accessible and communicated through various newsletters, personal mailings, and social media. Data was collected between mid-October 2015 and end of January 2016. Besides the items measuring the maturity criteria, the questionnaire contained general questions about the company size, industry, position, and country of the participants, as well as questions about the prioritization of activities in the past two years, and the focus area for the next two years regarding digital transformation.

3.3 Data analysis

For the analysis of data and the calculation of maturity stages, we used a quantitative approach. By applying the Rasch-algorithm to the survey data we were able to derive a *metric* for each item that represented its level of difficulty (Friedel & Back, 2012; Lahrmann et al., 2011). The software JMetrik was used to derive the metrics. The higher the metric score, the greater the difficulty of the item. Therefore, the easiest items have a negative metric, and a metric score of "0" represents the mean difficulty. Through hierarchical cluster analysis, we built five clusters of items with similar difficulty that represent the five maturity stages of the DMM.

For the analysis of the individual maturity scores, we used a combination of two scores (Friedel & Back, 2012): the cluster maturity represents the sequential fulfilment of items. Only when a defined threshold for each cluster is passed, is the participant assigned to the next cluster. This means that participants cannot reach a higher overall maturity by achieving only the difficult items and at the same time, neglecting basic requirements. The point maturity represents the overall fulfilment of all items, regardless of their difficulty. This allows participants who do not pass the threshold in one cluster, but have a better overall score fulfilment, to skip a cluster. The overall maturity score is the mean average of point maturity and cluster maturity.

4 Findings

The online-survey was publicly available, and participants were invited personally, through social and traditional media, and through business networks. We received 555 completed questionnaires. For the final data analysis, the following data sets were eliminated: questionnaires that only contained “I don’t know” answers (1); double entries (2); and clearly frivolous or test entries (5). For the calculation of the maturity stages, all answers for the same company were merged. This resulted in a final data set of 547 participants of 417 companies mainly from Switzerland (69%) and Germany (28%).

4.1 Maturity stages

Through cluster analysis of the weighted items, we identified the following five maturity stages. Understanding what criteria and activities described in these items were already fulfilled by most participants, gives us an indication on both difficulty and prioritization, as well as a probable sequence of digital transformation activities in the participating companies. Items that are already fulfilled by many participants can be seen as groundwork, while items with a higher degree of difficulty might be more advanced courses of action that build on previous activities. The following five stages were deduced from the items in each cluster.

4.1.1 Stage 1 – Promote & Support

The items clustered in this stage are mainly related to strategic prioritization, flexible work, and management support of digital transformation.

Stage	Dimension	Item ID	Short description of item	Metric
1	Strategy	ST7	Digital transformation as continual strategic change project.	-1.05
1	Collaboration	CO5	Employees work from home or on the move.	-0.82
1	Customer Experience	CX2	Customer interaction via both traditional and digital channels.	-0.77
1	Strategy	ST4	High value of digital business in overall strategy.	-0.76
1	Strategy	ST6	Promotion and prioritization of digital products.	-0.68
1	Organization	OR1	Digital product creation across all departments and functions.	-0.66
1	Information Technology	IT4	Regular update of IT infrastructure.	-0.61
1	Transformation Management	TM5	Top management recognizes the importance of digital business.	-0.6
1	Transformation Management	TM7	Senior mgmt. takes responsibility for digital transformation.	-0.56
1	Strategy	ST5	Core competencies for commercial success in digital future.	-0.55
1	Information Technology	IT5	Internal IT department ensures relevant digital technologies.	-0.53
1	Collaboration	CO3	External experts involved to develop knowledge of digitization.	-0.52
1	Culture & Expertise	CU3	Employees are familiar with digital products.	-0.48
1	Collaboration	CO6	Promotion of flexible, mobile work.	-0.42
1	Organization	OR2	Operational management across channels.	-0.41
1	Product Innovation	PI1	Product and service expansion with digital services.	-0.39
1	Collaboration	CO4	Internal experts on digital topics act as contact persons.	-0.34
1	Customer Experience	CX1	Customer experience is consistent across all channels.	-0.26
1	Transformation Management	TM6	Middle management promotes digital transformation projects.	-0.26

Table 16: Items clustered in maturity stage 1

Basic digital services for existing products and a consistent customer experience across multiple channels were initiated. Employees are familiar with existing digital products. The internal IT ensures the availability of relevant digital technologies and keeps the infrastructure up-to-date. Digitization has become a priority on the strategic agenda. Digital transformation projects are supported and prioritized by top, senior, and middle management. Also, flexible and mobile work that is enabled by digital technology has already been established. This indicates that an awareness of digitization among both management and employees, which supports initial digitization initiatives, constitutes the first stage of digital business transformation and is therefore labeled “promote & support”.

4.1.2 Stage 2 – Create & Build

In this stage, digital innovation plays a more prominent role, both at the strategic level and within product innovation. The strategic importance of innovation is stressed by explicitly promoting digital innovation, and systematically evaluating potential in new technologies.

This also includes evaluating internal communication or service processes, in terms of whether they can be improved by digital technologies. Suitable conditions for innovation are created by strengthening digital competencies, collaborating more strongly with the internal IT department, liaising with external partners, such as start-ups or universities, and also by allocating dedicated resources, time, and budget to digital innovation. Considering the focus on ideation and creativity, as well as strengthening digital activities within the company, this stage is labeled “create & build”.

Stage	Dimension	Item ID	Short description of item	Metric
2	Collaboration	CO2	Tools with videoconferencing and screen sharing.	-0.19
2	Process Digitization	PD4	Regularly check core processes for improvements.	-0.17
2	Collaboration	CO1	Digital platforms to cooperate with internal and external partners.	-0.16
2	Strategy	ST2	Promote digital innovation.	-0.15
2	Culture & Expertise	CU7	Evaluate errors in order to improve.	-0.14

2	Information Technology	IT1	Adjust our digital services at short notice.	-0.13
2	Information Technology	IT6	Internal IT department provides advice to the other departments.	-0.11
2	Product Innovation	PI2	New digital business ideas or business model implemented.	-0.09
2	Process Digitization	PD1	Digital channels integrated into communications & service processes.	-0.09
2	Product Innovation	PI3	Suitable conditions for developing digital innovations.	-0.08
2	Organization	OR7	Standardized, efficient procedures for cooperation with partners.	-0.08
2	Strategy	ST3	Systematic evaluation of technologies and digital innovations.	-0.06
2	Culture & Expertise	CU2	Digital competencies as important criterion in recruiting.	-0.06

Table 17: Items clustered in maturity stage 2

4.1.3 Stage 3 – Commit to transform

The items in this cluster belong mainly to the dimension of culture & expertise, but also to organization and transformation management. While in stage 2, the focus appears to be on experimenting with digital innovations, in stage 3, the digital transformation affects the internal culture and organizational structure more profoundly. Important capabilities within the company culture are a proactive error management and the communication of learning from failed projects, as well as willingness to take risks. Items related to the dimension "organization" describe a flexible organization that collaborates with partners and that is able to react quickly to changes. A company that is willing to perceive digitization as more radical change to their organization, needs to define roles and responsibilities for all processes related to the digital transformation, as well as creating a strategic plan for the transformation process that the company is willing to follow.

Due to the focus on activities with regard to company culture, changing organizational structures, and a more systematic transformation management, this stage is labeled “commit to transform”.

Stage	Dimension	Item ID	Short description of item	Metric
3	Product Innovation	PI4	Our employees regularly contribute ideas for digital products.	0.03
3	Organization	OR4	Able to react quickly to changes.	0.05
3	Culture & Expertise	CU1	Digital expertise as core component in developing employees.	0.11
3	Culture & Expertise	CU5	Digital innovation even when financially risky.	0.12
3	Organization	OR6	Partner network for digitization.	0.15
3	Culture & Expertise	CU6	Failed digital projects are communicated in a proactive manner.	0.15
3	Process Digitization	PD5	Automated routine processes.	0.16
3	Transformation Management	TM2	Defined roles, responsibilities and decision-making processes.	0.16
3	Culture & Expertise	CU4	Readiness to take risks with existing business.	0.2
3	Transformation Management	TM1	Digital transformation follows a defined strategic plan.	0.24

Table 18: Items clustered in maturity stage 3

4.1.4 Stage 4 – User-centered & elaborated processes

The items in the fourth cluster are related to a variety of dimensions. One common ground appears to be user-centeredness. This is revealed by the involvement of users in innovation processes, the personalization of customer experiences, and the focus on customer data when designing interaction. Another commonality is that digital transformation has progressed and shown results. The company is known as a digital innovator within the respective industry, and transformation goals, as well as KPIs for digital channels, are determined and reviewed periodically. Another indicator is digital ambidexterity, which is the ability to drive day-to-day operations alongside digital innovations (Gregory, Keil, Muntermann, & Mähring, 2015; Raisch & Birkinshaw, 2008).

For the focus on open innovation by involving users, personalizing customer experiences and processes based on usage data, and the improvement of processes by determining measurable goals, this stage is labeled “user-centered & elaborated processes”.

Stage	Dimension	Item ID	Short description of item	Metric
4	Information Technology	IT2	Test and modify new products using prototypes.	0.29
4	Organization	OR5	Pursue digital innovations alongside usual business operations.	0.31
4	Information Technology	IT3	Connect systems quickly to other services via open interfaces.	0.31
4	Transformation Management	TM4	Periodically review digital transformation goals.	0.33
4	Process Digitization	PD6	Data analysis results guide possible actions and strategic decisions.	0.39
4	Product Innovation	PI5	Customers included in the development of new product ideas.	0.49
4	Product Innovation	PI6	Customer testing to improve digital products.	0.51
4	Customer Experience	CX3	Digital content designed according to individual user situation.	0.52
4	Customer Experience	CX6	Insights derived from customer and interaction data.	0.52
4	Strategy	ST1	Regarded as drivers of digital innovation in industry.	0.56
4	Process Digitization	PD2	Goals for digital channels determined and reviewed.	0.57

Table 19: Items clustered in maturity stage 4

4.1.5 Stage 5 – Data-driven enterprise

The items with the highest difficulty metric are clustered in stage 5. These items are related to the use of advanced data analytics technologies for expenditure planning, collating customer data across multiple channels, real-time analysis, and personalizing customer interactions accordingly. This data is often available, however, only advanced companies use it appropriately for decision support or product development. Preconditions for the implementation of a data-driven business are internal expertise for data

utilization, appropriate technological infrastructure, and data governance across different business units.

The most advanced stage in the maturity model has been labeled “data-driven enterprise”, since all items in this cluster relate to the collection, analysis, and sense-making of customer data in business processes, and the utilization of measureable indicators for goal-setting or decision-making.

Stage	Dimension	Item ID	Short description of item	Metric
5	Transformation Management	TM3	Digital transformation goals are defined measurably.	0.66
5	Customer Experience	CX5	Customer and interaction data collated across different channels.	0.71
5	Process Digitization	PD3	Expenditure planning for communication based on media usage.	0.72
5	Organization	OR3	“Early warning” system to identify relevant technologies.	0.78
5	Customer Experience	CX4	Personalized digital customer communication.	0.85
5	Process Digitization	PD7	Expertise in big data used to develop new products.	0.97
5	Customer Experience	CX7	Customer data analyzed and acted upon in real time.	1.35

Table 20: Items clustered in maturity stage 5

4.2 Distribution of maturity scores

After defining the maturity stages, we calculated the individual maturity scores for each company that participated in the survey, as described in Section 3.3. Figure 6 gives an overview of the overall maturity scores of the 417 companies that participated in our survey. The overall maturity score is the mean average of cluster maturity and point maturity. The majority (>80%) of participants reach maturity scores 2 and 3, with very few companies achieving the highest maturity scores 4.5 and 5.

The analysis of results per industry shows that the highest mean maturity scores were reached in the IT & telecommunication industry (3.22), in retail / wholesale (2.98), and in transportation / logistics (2.94). These companies have been affected by digitization

early on and therefore, have already initiated programs within their organization. By contrast, the lowest mean maturity scores were observed with banks (2.42), in the machine industry (2.38), and in the consumer goods industry (2.23). The low results for banks comes as a surprise, since fintech start-ups have been seriously challenging the business model of established banks with digital services. However, these results can partially be explained by the comparably high participation of smaller banks, which on average achieved lower maturity scores than larger corporate banks.

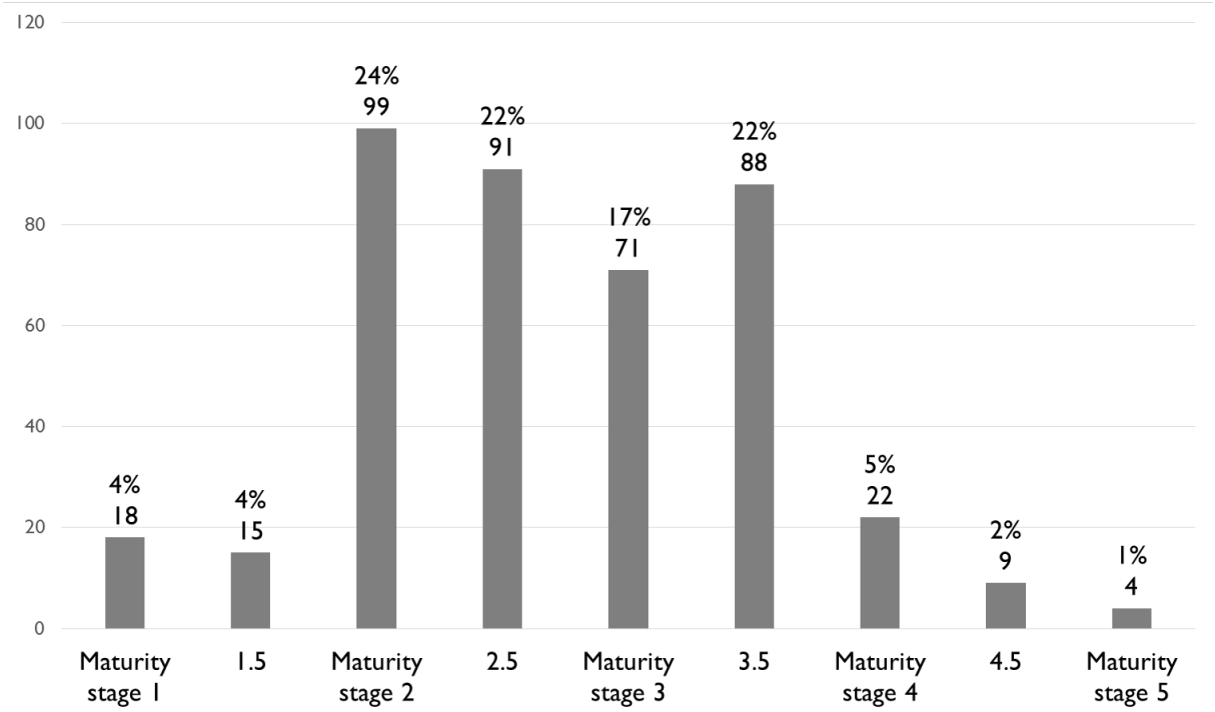

Figure 6: Distribution of overall maturity scores among participating companies (n=417)

4.3 Analysis within the dimensions

By multiplying the survey data (Likert value) with the metric, we calculated the degree to which the maturity criteria in each dimension were achieved. The mean achievement in each dimension also gives us an indication of which dimensions are difficult to achieve and which are easier. The dimensions with the lowest mean achievement are "customer experience" (37%) and "process digitization" (41%). This indicates that these are rather advanced activities that might be more difficult for organizations to tackle. By contrast, the dimensions "strategy" (51%) and "collaboration" (56%) received the highest mean achievement rates. This might either indicate that these dimensions are easier

to deal with for organizations, or that they subsume activities that are started earlier and therefore are more mature than other dimensions.

We also assessed the correlations between dimensions in order to identify any possible connections (see *Table 21*). The highest positive correlations were found between strategy and product innovation (.83); and strategy and transformation management (.80). The correlation between strategy and transformation management is not surprising. It shows that companies which regard digital transformation as an important part of their strategic agenda also have management support, define roles and responsibilities, as well as performance indicators for transformation. The high correlation between strategy and product innovation indicates that companies which make digitization a strategic priority are also willing to experiment with digital technologies and go about launching new digital solutions early on.

Dimension	CX	PI	ST	OR	PD	CO	IT	CU	TM	Mean achievement
CX										37%
PI	.71									46%
ST	.62	.83								51%
OR	.62	.73	.75							45%
PD	.75	.78	.76	.77						41%
CO	.52	.70	.64	.64	.63					56%
IT	.58	.65	.63	.73	.67	.63				47%
CU	.55	.69	.72	.74	.70	.67	.63			47%
TM	.56	.70	.80	.75	.72	.70	.67	.74		47%

Table 21: Correlation matrix and mean achievement rates per dimension

5 Discussion

The findings of the maturity study provide deeper insight into the stages of digital business transformation. The following conclusions can be drawn from the empirical findings.

Digital commitment and affinity among employees are important prerequisites for digital transformation that often preexist within the workforce.

The findings of this study show that among the easiest criteria are relatively many items related to digital affinity and employee commitment, such as the use of digital tools for collaborating with other employees and external partners, the appointment of internal experts on digital topics, the familiarity of employees with digital products, and the promotion of digital innovation within the company. This shows that the workforce is used to using digital technologies in their daily work and they are open towards digital transformation. In this respect, our findings differ from the experience of some decision makers, who suspect resistance towards digital transformation, and prior research has shown that innovation processes are often constrained by resistance, slow accommodation and adoption (Abraham & Junglas, 2011; Svahn, Henfridsson, & Yoo, 2009). We suggest that when initiating a digital transformation process, managers can exploit the inherent affinity and openness of the workforce by adapting their leadership style accordingly and carefully managing the change process. It is evident that management support and persuasive, effective communication facilitate the transformation process (Kezar & Eckel, 2002). Other research has stated that leadership styles change towards transformational leadership, calling for employee self-motivation and self-responsibility (Bass, 1990). Another leadership style suitable for organizational change is so-called servant leadership, which is based on considering the needs of the followers, that is the employees, and gaining their trust, so that they are open to change (Baldomir & Hood, 2016; Dierendonck & Sousa, 2016). Adapting their their leadership style enables managers to take advantage of any preexisting affinity or even enthusiasm towards digital innovation.

The use of digital data requires more strategic collaboration between IT and business.

Our findings show that items related to big data analytics and usage are among the most difficult items at maturity level five. This indicates that – while the exploitation of big data for value generation is high on the agenda of many managers – real time analytics of customer data and acting upon these insights remains difficult for most companies. The results also show that the difficult items include both technical tasks, such as the actual collection of customer data across different channels or connecting systems using open interfaces, and business tasks, such as designing personalized content according to the individual user situation. There are many available sources of digital data, such as from customer interaction, but they are often not properly used and exploited. All data-related activities receive the lowest achievement rates in our survey. It seems difficult to form organizational practices on how to use the available data, who takes

ownership, and how to set-up these new workflows and governance structures. The integration of several systems where this data is stored is a challenge for IT, and in many large and globally operating companies, the exchange of data across organizational and regional units is unsatisfactory. In many organizations, the corporate IT has a mainly executional role as opposed to a strategically thinking and innovative one.

This calls for a more strategic collaboration between IT and business departments, since research indicates that the IT department is no longer entirely in charge of digital innovation, and employees outside IT also innovate with digital technologies (Tumbas, Schmiedel, et al., 2015). Since a good understanding of possible fields of application of digital technologies is fundamental to innovation, the IT department and business departments need to collaborate more closely on digital transformation, e.g. by strengthening business-capabilities within IT (Bassellier & Benbasat, 2004) or by increasing the IT-knowledge of executives (Turel & Bart, 2013).

Digital transformation seems to be intuitively managed rather than strategically planned.

Many items clustered in the first two maturity stages relate mainly to acknowledging the importance of digital transformation and experimenting with digital innovation. Defining a strategic vision, roles and responsibilities, measureable goals, and constantly reviewing the transformation roadmap are items clustered in later stages. The analysis of overall maturity scores of organizations showed that industries that were challenged early by digital disruption have achieved higher scores than other industries, such as manufacturing, which are also labeled “latecomer industries”. This indicates that at the beginning of the transformation process, companies tend to experiment with digital innovation or react to external changes, while only at a later stage does a more systematic planning of the transformation process evolve. This also shows that consolidating digital initiatives into an organizational change program is demanding. Some companies deal with the strategic importance of digital transformation by establishing a C-level role responsible for promoting, communicating and consolidating activities with regard to digital transformation (Horlacher & Hess, 2016), or establish a dedicated implementation team for developing organizational change strategies (Higgins et al., 2012).

5.1 Contribution

Coping with the challenges of digital transformation is of considerable interest to both researchers and practitioners. Digitalization creates are multiple challenges for organizations, including the alignment of business and IT (Reynolds & Yetton, 2015), new roles of CDO and CIO (Horlacher & Hess, 2016; Weill & Woerner, 2013), and the development of digital transformation strategies (Matt et al., 2015). Understanding the stages of digital transformation contributes to the body of knowledge on enterprise transformation processes, which entail unplanned and radical organizational changes, as opposed to evolutionary ones (Kotter, 1995). For practitioners, the results may help managers to assess the status quo of their organization and identify possible new courses of action. This understanding can contribute to more systematic and strategic change processes, as opposed to intuitive reactions to external turbulence. Furthermore, even though a maturity model suggests that a more advanced stage produces better performance, this correlation is not proven and even may not exist at all. The maturity model in this study is simply used for mapping out the typical stages, but every company needs to decide whether the activities in each stage are appropriate, feasible, and relevant for the specific industry, business model, and competitive context.

5.2 Limitations

This research has produced some interesting and useful findings, but we wish to point out some limitations that need to be considered when interpreting the results. First of all, the survey data is based exclusively on participant self-assessment, which might cause a certain bias. In order to mitigate such risk, further research could complement this survey with expert evaluations, in order to correct any bias. Also, the survey requires participants to assess their organization, which might be difficult, depending on the level and degree of insight on which a participant can draw. We also acknowledge that even though the scales have been carefully developed, based on the literature and multiple focus groups, a final evaluation of the measurement instrument, as demonstrated for example in Raber, Epple, Winter, & Rothenberger (2016), has not yet been conducted. Lastly, it should be mentioned that the questionnaire was only presented in one of the four official Swiss languages (German) and therefore, the results are limited to this user group.

6 Conclusion

In this research, we set out to better understand how organizations tackle their digital transformation, by inductively designing maturity stages for a predefined set of criteria. The results from our empirical study show that understanding the strategic importance of digitization, as well as using digital technologies for collaboration are already undertaken in the majority of companies. However, creating a personalized customer experience based on big data analysis or automating processes, is characterized by lower achievement rates. This indicates that the primary stages of the digital transformation process are related to creating awareness, promoting the potential offered by digital technologies, and experimenting with digital innovation. In the next stages, companies start to go about digital transformation in a more systematic and strategically planned manner, by creating measurable goals and defining roles and responsibilities in the organization. These results help practitioners as well as researchers, in better understanding the processes by means of which organizations actually engage in their digital transformation.

7 Acknowledgements

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E. Disentangling the Fuzzy Front End of Digital Transformation

Title	Disentangling the Fuzzy Front End of Digital Transformation: Activities and Approaches
Authors	Sabine Berghaus, Andrea Back
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Table 22: Overview contribution E

Digital transformation poses critical challenges to organizations. The initial phase – the "fuzzy front-end "– in such a profound innovation process is often perceived as ill-defined and chaotic, yet it may have great impact on the outcome. However, managers struggle with initiating this process and prioritizing between different activities. Prior research has pointed out the importance of a digital transformation strategy, however, less emphasis is put on the activities that enact this strategy. Drawing on qualitative data from eleven organizations with an ongoing digital transformation program and by employing activity theory, we delineate nine patterns of typical activities in the beginning of digital transformation. The prioritization of these activities reveals five approaches – centralized, bottom-up, IT-centered, innovation-centered, and channel-centered. The results contribute to a better understanding of the initial phases of digital transformation for practitioners and complement prior research on digital transformation strategy with deeper insights on typical activities and approaches.

1 Challenges in Initiating Digital Transformations

Digital transformation (DT) is critical and relevant to the survival of organizations in all industries (Kenney et al. 2015). It challenges managers to rethink their business models, foster digital innovation as a key driver for economic success (Gregor and Hevner 2015), and adapt their organizational strategy, structure, and culture to the requirements of the digital age (Matt et al. 2015; Sia et al. 2016). There are several factors that make digital transformations particularly demanding for organizations: First, digital transformation can be a radical and disruptive change where organizations transition to completely different state (Christensen 1997; Lyytinen and Rose 2003). Second, new demands of the network society (Clegg et al. 2016), changed user behavior (Brenner et al. 2014), and new technologies, such as connectivity of devices and mobile data access (Dery and MacCormick 2012) drive the speed of digital transformation. These diverse and novel external stimuli require decision makers to explain and interpret these signals and define a strategic vision for the future. This sensegiving process includes all employees and might also produce competing perspectives in different parts of the organization (Balogun et al. 2015). Third, organizational structures and routines are central in implementing the digital transformation vision (Rerup and Feldman 2011) and facilitate returning to stability and control after a phase of rapid and disruptive change (Berente et al. 2016). That is why the topic of how a company should approach its digital transformation is being integrated into the overall corporate strategy to a greater extent rather than merely part of the IT-strategy, and executives are called to define a digital transformation strategy (Hess et al. 2016).

As a matter of fact, the outcome of an innovation is not yet clear in the beginning (Rhea 2003), which is why the initial stages of an innovation project are often perceived as ill-defined, random, and mysterious, and are therefore called the “fuzzy front end” (Reinertsen 1999). As digital transformation constitutes an organizational innovation process, this initial phase is a phase of experimenting, assessing opportunities, and collaborating to define the direction, actors, and approach before the start of a digital transformation program. Improving these initial stages from the first sensing of the need to change to the implementation of a specific innovation project bears great potential to impact positively on its success (de Brentani and Reid 2012; Gregor and Hevner 2015; Koen et al. 2002). While the front end of this complex organizational change is crucial to its success, it has received comparably little attention in research (Berghaus 2016).

In product innovation, the fuzzy front end finishes as soon as a formal innovation process starts, that is usually when a product enters the stage-gate-process (Markham

and Lee 2013). The so-called “gate 1” marks the idea screening, when an idea is either terminated or enters formal development (Cooper 2009). However, since the processes are more complex in digital transformation, it is less obvious to identify the corresponding “gate 1” that marks the exact end of the fuzzy front end. In product innovation the fuzzy front end is a contained phase and almost a routine task for an innovation team. In digital transformation, the fuzzy front end includes not only product innovation but changing the identity of the organization itself, which does not only comprise idea generation but deciding if and where to innovate, which has implications for multiple stakeholders and employees. This is a non-routine task for the top management as well as for the project teams or task forces that are enacting the various activities. The gate 1” that concludes the fuzzy front end in digital transformation is the awareness that digitization has significant impact on the organization and may require transformational efforts. This could be the involvement of the top management instead of single initiatives by single actors; the initiation of an organizational change program instead of scattered, unrelated projects; a dedicated budget, team, and deliverables instead of skunk works. Therefore, the end of the fuzzy front end of digital transformation is not a simple idea screening followed by a stage gate process as in product innovation but marks the transition from single digitization activities to a transformation program of the organization.

Despite its relevance, anecdotal evidence shows that managers often struggle with understanding the impact of digital transformation and are unsure where to begin their own organizational transformation process. Research has uncovered a multitude of approaches to transform an organization for the digital age: Some organizations focus on leveraging the benefits of multiple digital channels (Hansen and Sia 2015), some take a more entrepreneurial approach in order to build a digital ecosystem (Hu et al. 2016), some focus on fostering digital innovation in order to achieve a competitive advantage (Sedera et al. 2016), while others suggest a collaborative workshop process to design a strategic transformation (Davis et al. 2010). These examples demonstrate that the current digital transformations are a new phenomenon that incorporate multiple smaller change processes that are affecting organizational routines.

Prior research has come to the conclusion that organizations need to approach their digital trans-formations by designing a digital business strategy (Bharadwaj et al. 2013; Hess et al. 2016). However, due to the fuzziness of the initial stages, the definition of a holistic strategy is not always a viable first step. Therefore, we suggest broadening the unit of analysis from a digital strategy to a system of activities undertaken during the beginning of digital transformation. Activities and organizational routines are of central

relevance in digital transformation since they enact the transformation vision (Orlikowski 1996) and support stability and control during the implementation of organizational change (Berente et al. 2016). Thus, our research complements prior research on digital transformation strategy with this perspective on activities in the fuzzy front end of digital transformation.

Our research draws on rich data of multiple cases and employs activity theory as a structuring framework in order to gain a more complete view on the organizational set-up and activities during the fuzzy front end phase of digital transformation. Activity theory allows a more comprehensive study for its focus on activity systems rather than single artifacts and also takes the situational context into account (Alter 2003). Since most organizations have embarked on this change journey in the past years, this is an excellent chance to observe these initial steps and explore how companies have set-up activities in the fuzzy front end of this innovation process. This paper takes a descriptive approach to expand our knowledge about how companies actually approach, organize, and prioritize activities in their digital transformation. We are aiming at delineating patterns of typical activities and understanding more about how they are prioritized in order to identify different approaches.

We have been observing an ever growing research interest and discussion among practitioners on terms like “digitalization”, “digital transformation”, or “disruption” with varying terminology. In the management and organizational literature, the term “transformation” is commonly being used to refer to a substantial and large-scale change (Tosey and Robinson 2002). The term can apply to both changes on the industry and on the organizational level. On the industry level it refers to major digital trends, like cloud computing, mobile (Scornavacca and Barnes 2008), analytics or big data that potentially enable new business models (Berman and Bell 2011; Hanelt et al. 2015). On the organizational level, digital transformation describes changes that affect multiple dimensions within an organization, requires a re-definition of strategy as well as a change of organizational routines, where the outcome is significantly different to the original state. In this paper, we are using the term “digital transformation” only with regard to changes on the organizational level. Since digital transformation includes many different activities and could potentially refer to different things in different organizations, we also use the plural form to acknowledge the breadth of meaning.

Another term that has become popular in recent publications on digital transformation, is the concept of “disruption” and “disruptive change”. This is mainly based on the theory of disruptive innovation by Christensen (1997). In the current literature the

term “disruption” is mostly used to describe the ground-breaking impact of innovations as opposed to sustaining and incremental changes, in order to highlight the urgency of taking action.

2 Activity Theory as Structuring Framework for the Case Analysis

Activity theory is a multidisciplinary meta-theory directed towards understanding the object-oriented and object-mediated interactions between humans (Kuutti 1999). It is often used in studies of work and technology, e.g., in human-computer interaction (Engeström 2000; Kaptelinin et al. 1999; Nardi 1996) or learning (Nardi 2007). It has also been applied to research how certain activities are transformed by the use of information systems (Allen et al. 2013). In prior research, activity theory has proven to be well suited to investigate “micro-practices” in strategy in order to reveal strategic practices (Jarzabkowski 2003) and to research the transformation of work practices that are central to organizational change (Groleau et al. 2012). In another research, activity theory was used as a basis to develop an analytical tool to identify paradox in organizational practice (Prenkert 2006), which proves the practical applicability of the framework in activity-based management. Another relevant aspect of activity theory is that it includes different organizational actors and their collective intentions and thus allows managers to recognize tensions and dilemmas in the relation between different activity systems when translating a strategic vision into practice (Blackler and Regan 2009). A shortcoming of activity theory that some researchers point out is that a time axis is missing so that the framework does not display the development of different activities over time (Shih et al. 2013) or the hierarchical relationships between different activity systems (Nandi and Nandi 2017).

Engeström’s model of activity theory, depicted in Figure 7, is currently the most commonly used in research. Following is a description of the dimensions of an activity system and how we use these for studying digital transformation activities:

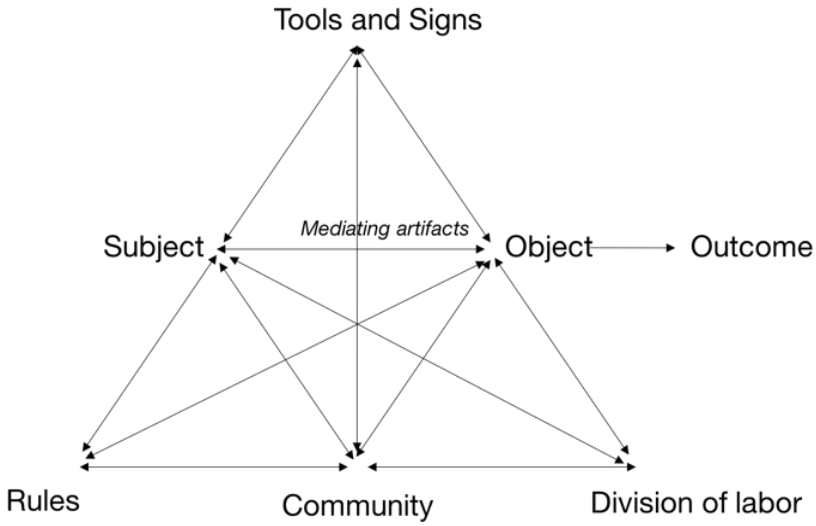

Figure 7. Activity theory framework adapted from (Engeström & Sannino, 2011)

- Subject (Sub): The subject is referring to the individual or group of people trying to reach an objective.
- Object (Obj): This can refer to the object on which the activity is performed or the objective of the activity.
- Tools (Too): Tools are any artifacts or instruments that subjects use in order to achieve the objectives.
- Rules (Rul): These are external rules and regulations for the respective industry, but also internal governance mechanisms and approval processes.
- Community (Com): The community is used to describe the social context in which the activity takes place, which includes other actors that participate in the activity.
- Division of Labor (DiL): This describes how the different actions are divided between different actors or hierarchical structure applied to the actions.

Activity theory has often been used to study individual activities, but is less frequently used to gain deeper insight in how systems of different activities relate and influence each other. Within digital transformation there are multiple sets of activities related to the overarching goal of digital transformation.

We believe that for studying the fuzzy front end in more depth by providing a detailed description of the set-up, roles, tools, and change within the company, activity theory provides a suitable framework since it allows to describe the typical courses of action within the fuzzy front end in a structured manner. It is also suitable to describe complex interactions, since it takes multiple perspectives into account (Engeström and Glăveanu

2012). By using activity theory as a guiding framework we are following Whittington's call to combine strategy-as-practice and information systems strategy in order to gain a better understanding of the strategizing process, explore what companies actually do in their strategy work (Whittington 2014) and how strategy emerges from activities in the organization (Jarzabkowski 2003).

In order to gain insight into the fuzzy front end of digital transformation, we decided to undertake in-depth analysis of multiple case examples. Our primary data source was the analysis of documents on transformation efforts and digital transformation impacts on the organization. These documents were prepared as part of an application for a "digital transformation award" in the years 2015 and 2016. It is part of a web award series that includes eleven categories for digital projects and is seen as one of the most prestigious awards for the digital industry in Switzerland, with over 400 applications across all categories every year. In order to keep the case examples confidential, the exact name of the award is not being disclosed. Insight into these applications was available since one of the authors is serving on the jury of this award. The selected applications provide a mixed sample of typical cases (Miles et al. 2014) from companies in Switzerland that comprises different industries and company sizes (see Table 23).

3 Insights on Activities from Case Analysis

Before presenting the activity systems identified in comparing the eleven cases, we would like to introduce some situational context. The overview of case examples examined in this paper (Table 1) shows company information, start of the digital transformation (DT) program, and motivations for each company. Despite covering many industries and company sizes, the motivation to start a transformation program often reflects similar drivers and objectives.

Three companies name "limiting existing structures" as their key driver to take action. This is referring to limiting IT infrastructures and capabilities, such as the lacking ability to quickly react to technological changes or implement up-to-date technology. "Changing regulations" was mentioned by an insurance company that specifically referred to a new national legislation forcing them to re-think their product landscape. Another driver is the "changing competitive landscape", which is reflected by the appearance of new, previously unknown competitors and start-ups.

Company	Industry	Size	DT start	Key Objectives	Key Drivers
Alpha	Consumer goods	1‘600	2012	Strengthen digital channels (improve customer relationship)	Limiting existing structures
Beta	Insurance	700	2011	Product innovation	Changing regulations
Gamma	Insurance	7‘500	2011	Product innovation	Changing competitive landscape
Delta	Consumer goods	1‘700	2014	Strengthen digital channels	Limiting existing structures
Epsilon	Real estate	750	2012	Ensure overall digital readiness	Digital industry transformation
Zeta	Logistics	62‘000	2014	Ensure overall digital readiness	Changing competitive landscape
Eta	Insurance	4‘300	2014	Ensure overall digital readiness	Changing competitive landscape
Theta	Transport	33‘000	2014	Ensure overall digital readiness	Digital industry transformation
Iota	Banking	60‘000	2012	Product innovation	Changing competitive landscape
Kappa	Education	70	2009	Ensure overall digital readiness	Limiting existing structures
Lambda	Retail	360	2010	Strengthen digital channels (integrate digital and physical channels)	Changing competitive landscape (economic situation)

Table 23. Overview of case examples

Companies stated that the need to take action and initiate a DT program became obvious with the impending risk of actual or possible new competitors. In one case the

company was already under growing economic pressure and needed to take urgent action. Companies that mentioned “digital industry transformation” as their main driver are sensing a general shift in their industry but not an urgent threat.

This motivation is also related to the objective “ensure digital readiness”. These companies do not feel that they need to take action in a specific area, but that they are monitoring the changing context and react whenever they sense the need to. Another important objective is improving digital channels. One company stated that it was only two years ago that they started selling their products online, while another company specifically wanted to establish deeper connections with their customers. The third overarching objective that was mentioned is product innovation and the need to explore new business models in order to stay ahead of the competition and generate new revenue.

This reflects the drivers and objectives before the companies actually started their digital transformation program by initiating different activities. The descriptions of the activity systems identified in this research follow the activity theory framework as guiding principle. During the analysis it became clear that despite the companies being diverse in industry and size the activities have strong similarities. Note that the following descriptions summarize the aggregated empirical findings from all companies that conduct this activity, which means that not all details apply to each company.

3.1 Improve digital channels (AS_01)

This activity system is directed towards the objective of setting up, operating, and improving digital channels, such as websites, online-shops, or mobile apps (Obj). In every case example (Alpha, Beta, Delta, Zeta, Theta, Iota, Lambda) this is the daily business routine of a dedicated business unit consisting of up to 70 people (Subj). Important tools span from conceptual and visual design to programming and project management, and also include monitoring of analytics and social media channels for feedback (Too). Rules influencing this activity are the alignment with existing strategies and compliance with security guidelines of the firm (Rul). In one case, also regulatory guidelines for the industry need to be followed. In three case examples, the work is divided between one global and multiple regional units, wherein the global unit is providing guidelines and the regional units are responsible for implementing them in their markets (DiL). Important community members include gatekeepers to other business units or to regional units (Com). It is notable that two companies are also involving

customers as test users for new features or innovations or have those tested by their own employees.

"In the beginning it was surely chaotic. The multichannel unit was built from scratch and we had to define all elements, such as our strategy or the innovation process. We moved people from other business units into the new multichannel unit, e.g. online marketing experts, because the marketing department did not really have expertise on digitization." (Banking)

3.2 Define processes and IT-infrastructure (AS_02)

This activity system includes all activities that are initiated for an updated infrastructure and simplified processes (Obj). Since this is not a usual daily activity, companies set up a new business unit or team for this (Sub). In two out of the five cases, the CEO and the CIO are also actively involved in this activity, not just in a supervising function. This shows the strategic importance of this activity for the company within its transformation efforts. Tools mainly include requirements definition and the selection of suitable technical frameworks, e.g. ERP or PIM systems (Too). It is also notable that companies use previously proven approaches for the process definition. Rules include mainly the existing IT strategy and given technical infrastructures (Rul). Partner networks also play a big role in this system. Partners can be IT partners for outsourcing, consulting agencies, and specialized partners for certain processes such as fulfilment or payment (Com). As for division of labor, the internal IT is in the lead, while partners get involved for specialized work packages and other business units engage in the process definition as needed (DiL).

"When digitization became a priority, we needed to prepare ourselves. We had old legacy systems, we had old infrastructure, employees were not mobile, there are many prerequisites that are important but that were not there. I would say that we prepared to be "digitally ready". We invested in service oriented architecture, in mobile infrastructure and process models." (Real Estate)

3.3 Adapt work practices (AS_03)

This system involves adapting daily work practices in order to implement the digital transformation of the company (Obj). The acting subjects are diverse, ranging from all employees, to the product development team, or the management team (Sub). This activity is completed by establishing additional regular meetings between the leaders in

the organization; applying new approaches, such as design thinking; switching to agile approaches (not only in software development but also in other functions); or using new tools that require employees to change their daily work practices and enable closer collaboration (Too). The top management serves mainly as supervisors and sponsors of activities, while the middle management is responsible to implement these changing practices within their respective business units (DiL). Sometimes, also external partners are involved for consulting purposes (Com). New work practices are required to follow existing compliance and security requirements (Rul).

"Everybody had to change, not only those that were driving the change, but everybody had to learn how to share information, how to store information correctly. We abolished Word, Ecel, Outlook etc. and put information in a central space so that employees that did not share information were isolated.» (Education)

3.4 Create innovative digital business models (AS_04)

While continuous innovation of existing products or services is part of the digital channel management or adapted work practices, this activity system is being initiated in order to think ahead and develop more radical innovations or innovate the business model (Obj) of the company. This activity is carried out by dedicated teams or even newly set-up business units (Sub). Tools used for this activity comprise systematic trend scouting; evaluation and road mapping of trends; prototyping and pretotyping; design thinking; internal hackathons or idea contests; and setting-up strategic venture funds to support start-ups (Too). It was noteworthy, that the speed of this activity varied greatly among the companies in the sample, ranging from the subjects meeting in workshops four times a year to bi-weekly coordination meetings with the management team. Rules applied to this system are the alignment with the corporate digital strategy as well as internal approval processes (Rul). Partners play a big role in this activity. All companies in the sample collaborate with start-ups, expert freelancers, universities, or agencies in order to develop ideas (Com). Four companies even build a partner ecosystem with standardized processes for selecting and collaborating with a fixed set of partners. Two companies involve customers as lead users in the development of new innovative product offerings. Another surprising finding was that one company stated that during this activity they are also collaborating with competitors, e.g. in start-up accelerators. Subjects, partners and other business units collaborate during the ideation, while partners are often responsible to create mockups or prototypes, and business units are responsible for the implementation as soon as an idea proofs feasible (DiL).

"We have a lab with external people to scout for these weak signals, prioritize them, and develop a prototype to test ideas. We are still focusing on our core business and we do not have the skills to test new technologies quickly, you need makers, you need dreamers, you need to collaborate with start-ups and this is not our core competency.» (Real Estate)

3.5 Develop digital strategy (AS_05)

In three companies, strategy formulation and the development of a roadmap (Obj) is the task of the management team in cooperation with other business unit leaders, in the four other companies a dedicated project team is responsible (Sub). These project teams consist of various members of different business units: in one case just top managers are involved, and in another case intentionally members of different hierarchies are included for the definition of strategic goals and the detailed strategy formulation (DiL). In six cases, this is done using tools such as a standardized strategy process and various workshops, or assessments such as maturity models to examine the current status of the organization (Too). In three out of the seven companies using this approach external consulting firms are providing expertise on special topics (Com). Approving a digital strategy is the task of the top management and the advisory board, who also make sure whether the strategy complies with the overall vision and purpose of the company (Rul).

"We are a very traditional company. The digital transformation process started with a new lead for corporate development, who started to ask the question how we develop and change as a company in the future. This needed a lot of persuading with the management team. We hired an external consultancy and entered a very structured strategy process that lasted 14 months." (Consumer goods)

3.6 Align transformation initiatives (AS_06)

This activity is carried out when multiple digital transformation initiatives pre-exist within the company. Its objective is to align these different initiatives (Obj) according to the digital strategy and the approval of the c-level management (Rul). In both companies (Zeta, Theta) the internal IT department leads this activity (Sub). The reason for this is that both are larger companies with a strong internal IT. In one company the internal IT is the mandatory service provider and therefore has an overview on the complete digital portfolio. This led to the fact that they were the first to notice redundancies and the opportunity to create synergies. The IT project team defines guidelines and a

concept for aligning these initiatives and involves the business units as needed, while the c-level management, e.g. the CIO, is responsible for approval (DiL). Workshops with project leaders and portfolio management techniques are used to accomplish the task (Too). Besides the project leads additional internal thought leaders are also involved in the process (Com).

"We had the innovation unit that was founded two years ago. […] They were driving [the digital transformation]. Then there was a team in the IT and furthermore there were single experts that were pushing these topics. Then there were the same teams in other sub-organizations. At some point the top management consolidated these different activities and coordinated them across all organizational units which was a huge task to accomplish. You need to establish gatekeepers, find people that can do that and you have to convince people that this is necessary." (Logistics)

3.7 Define governance (AS_07)

This activity aims at re-defining roles and responsibilities regarding digital processes in order to react faster to market trends and user needs (Obj). This is done in an iterative manner and may even involve changing career paths in order to fill new roles and enable new decision processes (Too). In all companies (Zeta, Eta, Theta) a newly developed project team is responsible for defining governance in collaboration with business unit leaders (Sub). This process is aligned with the digital strategy and approved by the CEO or an expert committee (Rul). All employees are eventually involved (Com) and while the project team sets the guidelines, the supervisors are responsible to implement the changes (DiL).

"Our top management decided that digital transformation requires a change in organizational structures. This means that employees can now take a specialist career besides the classic career path. We introduced a new business unit which is lead by a digital transformation officer […] who did not primarily have industry knowledge but change management experience." (Insurance)

3.8 Change organization culture (AS_08)

In the majority of companies (Beta, Gamma, Epsilon, Zeta), this activity is owned by the top management in collaboration with the HR department (Sub). The goal is to adapt the behaviors of the employees accordingly, so they are acting more self-empowered,

pro-active, and entrepreneurial (Obj). This is done by means of changed yearly assessment and behavioral guidelines for the employees (Too) according to the digital strategy and existing compliance guidelines (Rul). One company stated that they use events or contests as tools to communicate the strategy to employees in an emotionally engaging way. This activity is not only directed towards the employees but also to the top and senior management, e.g. by full day workshops that explicitly aim at training the top management. Eventually the middle management and supervisors (Com) are affected by this activity as well. While the HR department designs new guidelines and e.g. assessment processes, senior managers and other supervisors are expected to live and communicate the change to the employees (DiL).

"We have a program that includes the middle management that enters full-day events with short presentations and hands-on exercises, such as pretotyping. We are planning to extend this program to other leadership positions.» (Logistics)

3.9 Strengthen collaboration (AS_09)

Digital transformations both requires and enables a stronger collaboration and connection (Obj) between different business units. This activity is mainly driven by the top management, the digital transformation project team, and the human resources (HR) department (Sub). The companies in our sample (Gamma, Zeta, Eta, Theta) tried to achieve this in multiple ways, e.g. by relocating into a new headquarter with open work spaces; providing a modern infrastructure, e.g. smartphones, for all employees; and introducing flex-work models and social platforms to collaborate virtually (Too), according to existing behavioral, compliance, and security guidelines (Rul). Selected pioneer users enable this cultural change within the organization by assisting other employees with the adoption and leading by example (Com). The usage of these collaboration platforms requires employees to adapt their behavior which at the same time has an influence on the company culture. Completing this activity requires top management, HR, and also the IT-department to define new guidelines, and supervisors and employees to adapt accordingly (DiL).

"We had a company-wide project to connect employees. Not everybody had a computer before, we had people working in the field. Now everybody has a smartphone and now they have access to all information and communication channels and are more connected. This changed communication [within the organization] completely." (Transport)

3.10 Overview and Prioritization of Activities

After describing the most typical activity systems that occur in all case examples, we were interested in how organizations approach the fuzzy front end of digital transformation by prioritizing certain activities over others. In order to identify different approaches to digital transformation that are shaped by these activities, we deducted the order of the activities from the data sources. In particular, we were interested in the initial activities that companies began with when starting a digital transformation program. All the organizations in our analysis were advanced in their digital transformations and had started several activities in the past years. In this research we retrospectively explored how companies began their digital transformations and in what order they initiated the subsequent activities.

Table 24 shows an overview of which activities play a key role in the digital transformation efforts in which company as well as the chronological order in which activities have been initiated in each organization.

Company	AS_01	AS_02	AS_03	AS_04	AS_05	AS_06	AS_07	AS_08	AS_09
Alpha	1	2			2				
Beta	2	4	4	1 (X)	3			4	
Gamma				4	1			3	2
Delta	1	2			2				
Epsilon		1		3	2		3	4	
Zeta	2			2	3	1	3	3	2
Eta			3	3	1		2		2
Theta	3					1			2
Iota	0			1					
Kappa		1	2						
Lambda	1								

Legend:
Darker color - activity was initiated earlier; numbers represent the order of initiation.
"0" – activity already existed (in a different form).
(X) – activity was initiated, but discontinued due to lacking success.

Table 24. Overview and prioritization of digital transformation activity systems

4 Approaching the Initial Steps of Digital Transformation

The analysis of case examples, the description of activity systems, and the initially prioritized activities reveal five typical approaches how organizations tackle and manage the fuzzy front end of digital transformations. For each case we observed what activity triggered the initial step in digital transformation and what business unit was responsible for guiding the next step. In this section we discuss the different approaches and reflect on the usage of activity theory.

Centralized approach: These companies take a holistic approach to digital transformations (Gamma, Eta). They start by defining a digital strategy or include digital transformation as a key component in their corporate strategy. The fuzziness in this approach mainly arises from the re-definition of roles and responsibilities and is being structured by the distribution of work packages. This centralized approach often follows a typical strategy formation approach, by first analyzing the current status and identifying gaps in order to form a roadmap. For this a variety of tools and frameworks exists and has been developed in prior research, e.g. for diagnosing and improving digital service innovation (Nylén and Holmström 2015) or assessing digital threats to form new business models (Weill and Woerner 2015).

Bottom-up approach: In these companies, digital transformations start with scattered initiatives in various business units (Zeta, Theta). The challenge for these organizations is to create transparency of these pioneering digital initiatives and align them into a synchronized program, while also resolving conflicting responsibilities. Also, the top management needs to understand the importance of a holistic digital transformation program and eventually take ownership for guiding the transformation (Horlacher and Hess 2016). For managing bottom-up initiatives research has shown that different approaches exist – convergence, coordination, and separate stacks – depending on the degree of integration and the organizational set-up (Weill et al. 2013).

IT-centered approach: These organizations approach digital transformations in the first place as a technology-focused project (Epsilon, Kappa). They start by building an appropriate and future-proof digital infrastructure and then continue with more strategic and cultural-centered approaches. Their main challenge is that their current infrastructure and processes inhibit the implementation of digital innovation. This approach is taken by companies that start their digital transformations at a time when they are not under immediate competitive or economic pressure and therefore can invest more in building the infrastructure in order to achieve digital readiness. However, research has

also uncovered that the focus on IT investments may not pay off and therefore CIOs find themselves under increasing pressure (Gerth and Peppard 2016) to not only focus on IT but align technology with business and strategic goals to a higher degree than before (Reynolds and Yetton 2015; Weill and Woerner 2013).

Innovation-centered approach: These companies focus on developing innovative solutions and pushing forward industry standards already in very early stages of digital transformations (Iota, Beta). This approach is adopted by companies, who focus on excelling in their industry and become an innovation leader. For them, digital innovation can serve to identify new business models in saturated markets and position themselves in a positive way during times of crisis. Therefore, this approach requires a proactive company culture. Most other companies tend to be rather cautious and adapt a "smart follower" strategy, by monitoring innovations and trends and start implementing them, as soon as they proved to be successful and feasible. Other research has also confirmed that companies that take an innovation-centered approach require an institutional entrepreneurship mindset within the company (Hu et al. 2016) and an environment that fosters creativity (Oldham and Da Silva 2015) in order to develop successful digital innovations.

Channel-centered approach: This approach is adopted by companies that have a low digital readiness (e.g. no online shop available or strong focus on brick-and-mortar stores) and need to reach level with the industry standards (Alpha, Delta, Lambda). Three of these companies notice a shift in consumer behavior which drives these activities. They focus on building and improving their digital channels as first key activity of their digital transformation program, aiming at strengthening the relationship to their customers through various initiatives. Current challenges revolve around incorporating technologies such as big data analytics in their operations. A particular challenge lies in combining digital and physical channels. The focus on digital channels is a common starting point for digital transformations, which can also be found in other research, which states that the transformation towards omnichannel retailing require deep organizational changes (Hansen and Sia 2015).

We have also found activities that are related to cultural change (AS_09, AS_08) and change of work practices (AS_03) to also be important in digital transformations, even though we could not identify a "culture-centric" approach. Companies that explicitly launch these activities do not only perceive digital transformations as an operational or strategic change, but as a cultural shift for the entire organization. However, we have

noticed in the course of the analysis that these activities are not something that companies begin with, but they are often introduced once it becomes obvious that the earlier activities have an impact on the daily work practices, behaviors, rules, and values within the organization.

The use of activity theory as a framework for this paper has proven to provide a systematic guideline in order to structure the different activity systems. It helped us during the analysis to explore the activity systems to a more extensive degree and capture subjects, rules, tools, or other details that would have been otherwise neglected. The dimension "community" for instance enabled us to include other important agents that are affected by or included in the course of an activity, which shows the intricate nature of each transformation activity. Broadening the focus to the larger social context of an activity is one of Engeström's contributions to activity theory (Allen et al. 2013). Since transformation is a complex change process that cannot be conducted by a single person or team but that is comprised of several steps and includes multiple perspectives, we found the activity theory framework to be ideal to break up this complex change process into smaller units that lead up to a larger goal. While our analysis focused on collecting data from multiple cases, we think that activity theory is also well-suited for an in-depth analysis of a single case, revealing motivations, combinations, causes, or contradictions within and between different activity systems, which was not in scope of our research. Another aspect that we would like to mention is that activity theory focuses on intended actions. We did not find any explicit evidence in our data, but we assume that emergent or unintended activities also play a relevant role in organizational transformations. This might be an interesting path for further research in this field.

5 Recommendations for Practitioners

This analysis of the different activities and how organizations approach their digital transformations leads us to recommendations for practitioners in the field of digital transformation. The choice of certain activities varies according to the existing assets, the market context, and the situation of the company. We found, however, that depending on the approach a company certain activities are more appropriate than others. We base our recommendations on the specific activities that the companies in our sample experienced as successful and helpful in order to achieve their goals. In the following paragraph we list the key recommendations for companies that approach digital transformations from a centralized perspective, from a more specialized perspective (bottom-

up, channel-centered, or IT-centered approach), and from an innovation-centered perspective.

5.1 Seizing the Creative Potential of the Fuzzy Front End

Companies that take a centralized approach initiate their transformations with structured analysis in the fuzzy front end in order to make sense of early signals from the outside and define a strategic roadmap. For these companies, we would like to emphasize that even though the fuzzy front end of digital transformation can be a vague, chaotic, and precarious process, it also bears a lot of creative and innovative potential. While there is an understandable desire to reduce the uncertainty and bring structure to the fuzzy front end, managers might also acknowledge the natural fuzziness of this stage and find a balance between structure and the positive impacts that may arise from experimenting and fast trial-and-error learning. Theses measures strenghten collaboration, networked thinking, and innovation and therefore complement the structured, systematic, analytical approach to digital transformation.

5.1.1 Use Hackathons, Innovation Jams, or Offsite Days for Ideation

In order to assess the potential of ideas, companies in our sample used full days of ideation or hackathons in order to quickly create and evaluate ideas through prototypes. While hackathons are traditionally known as coding events for programmers their principle is not restricted to software development, but also design thinking or other innovation techniques can be used. One company in our sample invites employees in the company to an offsite event over two days where they allow them to work on new ideas. The management was surprised that teams spent long hours working during these days, even until nighttime, which demonstrated that they enjoyed being free from their daily business, connect with colleagues from other business units, and explore new ideas in a creative and playful way. The number of participants in this event also grew from year to year and even the CIO has expressed the intention to enter this event in the future. In another company, teams that have an innovative idea that they want to explore further can enter a contest and win internal venture capital in order to realize it.

5.1.2 Introduce Fast Track Budgets

In large companies the budgeting processes take up a lot of time. In one case example, it would take up to six months from application until the budget was granted and the

team could actually start to create a prototype to test an idea. When this company introduced the possibility to obtain smaller "fast track budgets" that could be used to test new ideas, they experienced an increased number of ideas which lead to an increased degree of innovative products and services, some of them would eventually enter the market. Another company introduced internal contests where teams with an innovative idea could apply for budgets, similar to venture capital, in order to further work on their ideas. While ideas that demonstrate strategic importance for the company are promoted by an executive sponsor, companies benefit from also developing a larger pool of innovative ideas in multiple areas of the organization.

5.1.3 Eliminate Administrative Barriers

Besides financial means digitization and experimenting with digital innovation requires connected thinking within the organization. Some companies in our sample had the experience that their existing structures hindered information flow and data exchange. In one case, customer data was available but could not be exploited in order to create personalized digital offerings. In order to enable this, data scientists were hired and a new technological solution had to be created first. In another case, very strict working time regulation did not allow the employees to work in times when they felt most creative and got in the way of flexibility in projects. By changing these, this company enabled its employees to work in a more flexible way and made room for a trust-based leadersthip. By making these comparably minor changes in administrative regulations, these companies enabled their employees to work in a more networked, flexible, and collaborative way.

5.2 Bridge Silos and Involve Different Actors in the Organization

Companies that take a bottom-up, channel-centered or IT-centered approach view digital transformation as functional challenge that they tackle in single areas, such as IT. Our research has shown that the activities related to digital transformation are very diverse and therefore also require a variety of actors. We would encourage managers to define the most important activities for the digital transfomation of their organization and then carefully reflect what diverse actors could be involved in these. We have seen in our analysis that companies collaborate with previous competitors, include junior employees in strategic decision making, or work with start-ups on ideas that are outside of their core business. This holds the potential for producing innovative ideas and accelerating the change process by combining diverse perspective. To minimize the risk

of competing views and ideas we recommend the comparative analysis of the different activities, e.g. by using the activity theory framework, and identify contradictions between the different objectives, actors, and community involved in each activity, similar to the approach of Prenkert (Prenkert 2006).

5.2.1 Re-Organize for Agile and Flexible Teams

While specialized departments have increased efficiency in the past, in the digital world these silos impede flexibility and agile reaction to changing requirements. One company mentioned that its reorganization followed the example of Spotify, where the entire organization is organized in self-organized, cross-functional, and agile teams (Mankins and Garton, 2017). This company also nominated a Chief Digital Officer who is the first management member with substantial digitization knowledge but no previous industry experience. A re-organization is often planned by the top management and can therefore cause insecurities among the employees. In this specific case, a participative and transparent approach was chosen and the team leaders where involved in the planning process from the very beginning. While a complete re-organization certainly extends beyond the FFE phase, in this case it became clear to a very early stage that teams should be organized as cross-functional teams around the products instead of staying in their functional units.

5.2.2 Work with Partners for Missing Capabilities

Companies in our sample indicated that the dynamic and fast development of technology requires new capabilities, such as specialized knowledge in fields such as data science or analytics, or the ability to explore new topics outside the company. One company in our sample worked with universities on a global level and supported promising research projects, while another case formed an innovation team that did not only consist of employees but also external experts, such as futurists or designers.

5.2.3 Use Customer Journeys to Facilitate Collaboration and Keep Focus

One cases that started with a channel-centered approach used customer journeys to streamline and simplify their processes and build a new customer experience centered around the user needs. In a next step they used these customer journeys to simplify their product portfolio and ideate on new products. By focusing on the customer journeys they discovered more potential to streamline, simplify, and innovate than they would

have if they had simply done a website relaunch. The cross-functional customer journey teams that worked in agile sprints also helped to break up existing silos and have staff from business units and IT collaborate more closely. In another case, these customer journeys helped to keep focus on the most important issues and prioritize resources accordingly.

5.3 Enable Cultural Transformations Instead of Innovative Lighthouse Projects

For companies that approach digital transformation from an innovation-centered perspective, the creation of innovative digital products and services as well as the identification of new business models for the digital future are of central interest. While other research stresses the importance to create a strategic vision for an organization's digital transformation our study and the use of activity theory shows that it is equally relevant to define how this vision translates into actionable activities and – vice versa – point out how existing activities contribute to the overarching goal. Even though this may sound obvious there are companies, such as case Iota, that focus on innovation activities while at the same time neglect to actively set up activities that enable collaboration within the company or a mindset shift among the workforce. The following examples help companies not only to focus on the innovative lighthouse projects, that take place in innovation labs but thus outside of the core innovation, but instead enable a transformation of organizational core values, leadership, and behavior.

5.3.1 Disseminate Learnings and Methods from Innovation Labs in the Organization

One of our cases had good experience in setting up an innovation lab with experts that were free from daily work. However, they also noticed that the employees in the core organization felt neglected and did not find a way to contribute their ideas. Furthermore, in particular employees that work with customers have a good idea of user needs and problems that form the basis for innovative solutions. By strengthening the exchange between innovation lab and core organization, the innovation team got more ideas on areas to work on, while at the same time the other employees benefitted from methodologies, learnings, and expertise from the innovation lab.

5.3.2 Demonstrate How Employees Contribute to the Overarching Goal

In cases where there is both a traditional physical business and a newer digital business, it can be a challenge to get employees that work in the traditional business, e.g. in the brick and mortar store or in the field, behind supporting the digital vision. In one of our cases this was done by changing the incentive system. For example, if a customer ordered online and picked up the product in the store, this was counted as revenue for the store. Thus, all employees supported the digitization activities, because the management made transparent how each employee contributed to the digital vision. In another case the cultural transformation was facilitated by clearly communicating desired behaviors to the employees in order to move to a more transformational leadership. These behaviors were communicated through videos and physical cards and HR structured the yearly assessment rounds around these. In a last case, the cultural transformation started with workshops for the top and middle management in order to align them with strategic decisions and teach them methods how they can lead change in their respective teams.

6 Conclusion

While this paper describes the various typical activity systems and discusses different approaches to manage digital transformations, we cannot make any remarks on one approach being more successful than another. Depending on the situational context of the organization, we might possibly find one company that failed with one approach, while another company has been highly successful with doing exactly the same. This is also shown by one of our case examples, which started with an innovation-centered approach, but terminated this endeavor due to the lack of outcome and switched to a channel-centered approach, while another organization stated that they have achieved a higher visibility and performance due to the focus on digital innovation. Since no “ideal” approach exists, managers tend to decide intuitively depending on their situational context. Each company thus comprises its path to digital transformations through a combination and network of several activity systems.

In this study we used activity theory as a framework to describe activities of organizations during the fuzzy front end of digital transformations. The prioritization of these activities reveal five approaches to initiate a digital transformation program: centralized, bottom-up, IT-centered, innovation-centered, and channel-centered. Data from eleven cases in Switzerland served as input for this research project. We feel that these results

shed more light on how managers approach the digital transformations of their companies.

However, we also have to state some limitations to this study. Since the data source was mainly based on award application documents, a selection bias has to be considered, since only successful cases are submitted and, furthermore, these might tend to bias towards only mentioning activities with positive outcome. This was mitigated by explicitly including corresponding questions (e.g. “What activities does your company need to improve on in the future?”) in the interviews. However, it was also found that the award applications contained very comprehensive and substantial information including honest statements about failures and a high degree of critical reflection. Table 24 also reveals that most companies initiate several activities consecutively, while within a few companies this is limited to one or two activities. Since in these companies the activities nevertheless lead to a major and substantial change, we would still argue that these cases can be counted as digital transformations. Also, in this paper we discuss isolated activities. In reality these are also influenced by different factors in the organization or in its context. Finally, it needs to be stated that the quality of descriptions within the applications documents varied between the different companies and there were not enough interviews conducted to qualify this research as in-depth multiple case studies.

These results may contribute to a better understanding of the initial stages of digital transformation and provide managers with a systematic compilation of different possibilities for structuring their own approach to digital transformation. For researchers it might be a promising field to study the performance of these approaches in different cases and different situational contexts in order to gain more knowledge on how to navigate the fuzzy front end of digital transformations more successfully.

7 Appendix – About the Research Methodology

The application documents that were used for the analysis of the case examples included the following information:

- Results of an online survey which include a self-assessment in the dimensions of a digital maturity model (Berghaus & Back, 2016) and free text entries to these questions.
- Written statement on: "What was your main progress within your digital transformation in the past 18 months?"
- Written statement on: "What activities were conducted to achieve this transformation progress?"
- Optional: complementary documents, e.g., presentations, market data, strategy papers (available in 9 out of the 11 cases).

We triangulated the data from these sources with additional interviews from all companies in order to gain a more holistic and complete picture of the fuzzy front end phase (Jick, 1979). In total, 18 interviews were analyzed for this research. Interviews were conducted with employees responsible for implementing digital transformation, who have a good overview of existing activities and are involved in the strategy formulation of the firm. Positions of interviewees included for instance Head of Digital Transformation, CIO, or Head of E-Business. Interviews were conducted in a semi-structured fashion and lasted between 35 and 50 minutes.

For the analysis of the material the following steps were followed:

- For each company we reviewed all transcripts of the interviews and all written documents separately in order to identify all key activities through open coding. Each key activity was labelled with a descriptive title, e.g. "build innovation lab" or "define digital strategy".

- For each activity, we extracted all information according to the six dimensions of the activity theory framework – subject, object, tools, rules, community, and division of labor – in order to gain a complete and systematic picture of the activities conducted.

- The total analysis across all companies yielded 41 activity systems. It already became obvious that many activities had strong similarities. In a next step, the key activities were clustered ac-cording to the overall objective of the activity. For example,

activities labeled “build innovation lab” and “change business model” have been clustered into “create innovative digital business models”. Overall, nine clusters of activity systems have been identified in this phase of the analysis.

- For each cluster, the detailed information in the six dimensions of the activity theory frame-work was consolidated and distinctive features were highlighted.

- In a last step, we re-read the data for each company and applied the clustered activity systems to each company in order to ensure validity of coding. During this stage, the chronological order of initiation of activities was captured for each company. Even though most companies conduct a combination of multiple activities, we were particularly interested in what their initial approach to digital transformation was and what activities were prioritized and considered most important to begin with. Therefore, we used these activities that were initiated first in each company to deduct the approaches.

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Curriculum Vitae

Sabine Angelika Berghaus
Splügenstrasse 7
9008 St.Gallen

19.07.1981 in Munich, Germany

Education

2013-2017	PhD Program in Management (Business Innovation) University of St. Gallen, Switzerland
2001-2006	International Information Management (Magistra Artium) University of Hildesheim, Germany

Work Experience

Since 2017	Freelance Digital Innovation Consultant www.sabineberghaus.com
2013-2017	Research Associate Institute of Information Management, University of St. Gallen
2010-2013	Senior Information Architect SapientNitro, Munich
2007-2010	Concept Developer BlueMars Gesellschaft für digitale Kommunikation mbH, Frankfurt a.M.
2007	User Experience Consulting SirValUse GmbH, Hamburg