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Becoming a Data-Driven Organization: A Comparative Case Study on Digital Transformation Strategies

Completed Research Paper

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Abstract

In today's data-centric era, organizations increasingly aim to operate more data-driven and therefore engage in digital transformations toward becoming a data-driven organization (DDO). To govern such transformations, top managers develop digital transformation strategies (DTS) characterized by different organizational ambidexterity approaches. This study analyzes how such DTS influence the process and (intermediate) outcomes of organizations' digital transformations toward becoming a DDO by studying two organizations undertaking such DDO transformations using the concept of organizational ambidexterity as a theoretical lens. On this empirical basis, we find that DTS characterized by different organizational ambidexterity approaches lead to different transformation processes and (intermediate) outcomes. Thereby, this study contributes to existing academic literature in the field of DDOs and DTS, as such transformation journeys toward becoming a DDO have not been studied in its entirety yet. Furthermore, our paper offers practical guidance for top managers to develop and implement a DTS suitable for their organization.

Keywords: Data-driven organization (DDO), digital transformation strategy (DTS), digital transformation, organizational ambidexterity, top managers

Introduction

Organizations are increasingly striving to become more data-driven to adapt to the ongoing emergence of new data-driven products, services and business models (Davenport and Bean 2018; Hartmann et al. 2016; Mueller 2022). This is primarily because such data-driven organizations (DDOs) demonstrate significant competitive advantages (Berndtsson et al., 2018; Constantiou and Kallinikos, 2015), enabled by more innovative business models and new, data-enabled products, improved processes (Sivarajah et al., 2017), and better decision-making overall (McAfee and Brynjolfsson, 2012; Svensson et al., 2019).

To become such a DDO and thereby ensure innovation, competitiveness and ultimately survival, organizations are increasingly engaging in digital transformations (Bean 2022; Cartwright et al. 2003). According to practitioner-oriented studies, such transformations are a top priority of top managers, resulting in nine out of ten organizations undertaking digital transformations with increasing investments in data (Gartner 2020; HCL Technologies 2021). To govern such complex digital transformations, in which “psychological, socio-cognitive, socio-technical, economic and political considerations intertwine” (Besson and Rowe 2012, p. 105), top managers—who are in charge of digital transformations (Garms and Engelen 2019)—define and implement a digital transformation strategy (DTS). According to Matt et al. (2015), a DTS addresses and details changes to products, services and business models, and serves as a “central concept to integrate the entire coordination, prioritization, and implementation of digital transformations

within a firm” (p. 1). As such, the DTS considerably shapes an organization’s journey toward becoming a DDO, thereby influencing the transformation process and (intermediate) outcomes.

In the context of coordinating the transformation journey through a DTS, a central objective consists in reconciling the “exploration of new [data-driven] possibilities and the exploitation of old certainties” (March 1991, p. 71). To sustain competitive advantages, organizations need to be able to perform both, explorative and exploitative activities (He and Wong 2004; March 1991; Raisch and Birkinshaw 2008). However, these two activities are fundamentally different, as exploration includes experimentation, risk taking, and innovation, whereas exploitation relies on refinement, efficiency, and execution (March 1991), and thus requires “fundamentally different structures, processes and strategies” (Hughes 2018, p. 2). To address this challenge, top managers engage in organizational ambidexterity (He and Wong 2004). Specifically, they either pursue DTS characterized by organizationally separating explorative and exploitative activities (structural ambidexterity) or DTS characterized by explorative and exploitative activities being reconciled on the employee level in one organizational unit (contextual ambidexterity).

In existing literature, the concepts of DDO, DTS and organizational ambidexterity have been studied in-depth independently of each other (cf. Birkinshaw and Gibson 2004; Fischer et al. 2023; Matt et al. 2015). However, the influence of DTS on organizations’ transformations toward a DDO still presents a research gap (Fischer et al. 2023; Matt et al. 2015), and Mitroulis and Kitsios (2019) state “the appropriate way to develop a digital transformation strategy has still no answer” (p. 3). For practitioners, however, this matter is highly relevant, as becoming a DDO proves to be a major challenge for organizations and their top managers, with only one in eight digital transformations being effective (Wade and Shan 2020). Accordingly, only 24% of surveyed organizations report to have become data-driven, and the share of executives reporting that their companies were driving business innovation with data has stalled at 60% for the last four years (Bean 2023). This reality underlines the need for an enhanced understanding of the influence of DTS on an organization’s transformation journey toward a DDO.

Against this backdrop, the paper at hand sets forth to address this practitioner challenge and research gap by answering the following research question: *How do different digital transformation strategies influence the transformation process toward a DDO and its (intermediate) outcomes?* To answer this question, we drew on existing literature and extensively studied two organizations that are currently undertaking such transformations. In doing so, we relied on the concept of organizational ambidexterity as a theoretical lens to differentiate the two analyzed DTS. As a result, the study at hand offers both theoretical and practical contributions. In terms of theoretical contributions, our work sheds light on organizations’ journeys toward a DDO, which have not yet been studied in their entirety (Berndtsson et al. 2018; Fischer et al. 2023) and thereby expands existing DDO and DTS literature. Building on this understanding, the paper at hand offers several practical contributions that guide top managers in identifying, comparing, selecting, and implementing DTS, while mitigating risks associated with their DTS along the way.

Our study is structured as follows: To begin, we provide an overview of the relevant conceptual foundations for DDOs as well as DTS and organizational ambidexterity. Subsequently, we briefly introduce the two analyzed organizations and explain our case study approach. We then present our results in two steps. First, we detail both digital transformation journeys of our cases, thereby explaining the individual context and highlighting the digital transformation process and outcomes. Second, we transition to a cross-case analysis, where we surface emerging differences, similarities, and overarching patterns. Finally, we conclude with discussing the theoretical contribution and practical implications of our findings, taking into account the limitations and associated future research directions of our paper.

Conceptual Foundations

To better understand how DTS influence the process and outcomes of a digital transformation toward a DDO, both the intended target state as well as the way to get there are of particular relevance. Therefore, we will first introduce the DDO concept, thereby building on the conceptual DDO framework of (Fischer et al. 2022). Subsequently, we will provide an overview on the concepts of DTS and, in this context, organizational ambidexterity, which we will use as a theoretical lens to differentiate different DTS.

Data-Driven Organizations

To adapt to today's data-centric era, organizations are increasingly moving towards data-driven products, services and business models (Davenport and Bean 2018; Hartmann et al. 2016; Mueller 2022). Following this development, academic researchers and practitioners alike are increasingly interested in the phenomenon of organizations becoming more data-driven, leading to an increasing number of publications on the notion of DDO in the last years (Fischer et al. 2022). As a result, a wide variety of different understandings of this phenomenon—expressed as explicit definitions or implicit descriptions—have emerged. These understandings vary greatly regarding their levels of richness and elaboration, ranging from rather simplistic, single-characteristic understandings to more complex, multi-characteristic understandings. On the more simplistic side of this spectrum, authors tie their understanding of a DDO to a single key characteristic such as data-driven decision-making (cf. Berndtsson et al. 2020; Schüritz 2017), data capabilities (cf. Lee 2017) or any kind of data usage to help drive action on the organizational level (cf. Halper and Stodder 2017). On the other side, authors such as Anderson (2015), Fabijan et al. (2017), Kearny et al. (2016), or Thusoo and Sarma (2017) combine two or more characteristics to craft more complex, multi-characteristic DDO understandings, thereby referring to culture, technology, abilities, data assets, processes and value-creation mechanisms. Illustratively, Fabijan et al. (2017) state that “data-driven companies acquire, process, and leverage data in order to create efficiencies, iterate on and develop new products, and navigate the competitive landscape” (p. 1). Likewise, Anderson (2015) combines “tools, abilities, and, most crucially, a culture that acts on data” (p. 1) to explain his DDO understanding.

What all these different understandings have in common, however, is that they draw from a set of five shared DDO dimensions, that Fischer et al. (2022) surfaced in a literature review (see Table 1). Based on these literature review results, Fischer et al. (2022) present a conceptual DDO framework that builds on Choo's (1996) concept of the 'knowing organization' and integrates existing DDO understandings. According to this framework, a DDO is “an organization (1) with a data-driven culture, enabling and inspiring organizational members on all levels to embrace data as the backbone of their actions and decisions; (2) with access to data capabilities including tools, talent, and infrastructure to gain insights from data; and (3) with organizational members consequently making their decisions based on data-driven insights. Further, depending on its specific focus, a DDO may also be characterized by a particular emphasis on (4) systematically acquiring data and purposefully interpreting and integrating these data [...], and/or on (5) creating data-driven value” (Fischer et al. 2022).

Building on this conceptual framework, the DDO concept can be distinguished from related concepts such as the data-driven business model (DDBM; cf. Wiener et al. 2020). While both concepts prioritize data-driven value creation and it could be argued that certain DDBMs require an underlying DDO with all its dimensions (e.g., to provide data-enabled services), other DDBMs suggested by Wiener et. al (2020), such as the sale or facilitation of data, do not require an underlying DDO with e.g., a data-driven culture.

DDO dimension	Short description
Data sourcing & sensemaking	Acquisition of (external) data and their purposeful interpretation and integration
Data capabilities	Abilities of an organization to use its infrastructure, tools, and talent to purposefully manage data
Data-driven culture	Organization-wide belief and value system that fosters the understanding, management, and exploitation as well as exploration of data
Data-driven decision-making	The act of making rational decisions based on data instead of intuition
Data-driven value creation	An organization's actions with the ambition to create value through data
Table 1. Dimensions of a DDO (Fischer et al. 2022)	

Drawing on multiple case studies with organizations across various industries and sizes, Fischer et al. (Fischer et al. 2023) found that practitioners similarly consider these five DDO dimensions when planning and implementing their digital transformation journeys toward a DDO. Accordingly, we will use this conceptual DDO framework as a guiding framework for our case study analysis.

Digital Transformation Strategies and Organizational Ambidexterity

In the context of continuously emerging new data-driven products, services and business models, organizations undertake an “ongoing process of adoption to a significantly changing digital landscape in order to meet the digital expectations of customers, employees and partners” (Teichert, 2019, p. 1674). This phenomenon is widely referred to as *digital transformation* (Vial 2019; Wessel et al. 2021). In the course of such a transformation, information technologies are no longer purely being aligned to business functions (cf. “IT-enabled transformation”; Brown and Magill 1994; O’Reilly and Tushman 1996), but they are fundamentally reshaping organizations (Yoo et al. 2012) and their business strategies (Bharadwaj et al. 2013; Morakanyane et al. 2017), and are ultimately redefining their value proposition and identity (Wessel et al. 2021). One aspired outcome of such a transformation—on which this paper focuses—is that of a DDO.

Due to the magnitude of this organizational change, digital transformations are highly complex processes, in which “psychological, socio-cognitive, socio-technical, economic and political considerations intertwine” (Besson and Rowe 2012, p. 105). Consequentially, this endeavor poses a challenging task in particular for top managers, who “define the firm’s strategic direction, and provide the context within which digitalization efforts may unfold” (Wrede et al. 2020, p. 1564; Garms and Engelen 2019).

To meet these digital transformation challenges, top managers formulate a “central concept to integrate the entire coordination, prioritization, and implementation of digital transformations within a firm” (Matt et al. 2015, p. 1), referred to as DTS. As such, a DTS addresses all business segments and encompasses the use of technologies, changes in value creation, structural changes, and financial changes (cf. Matt et al. 2015; Chanas et al. 2019; Hess et al. 2020). Moreover, it involves and fuses business strategies (e.g., digital business strategy) and functional strategies (e.g., IT strategy; Chanas et al. 2019; Matt et al. 2015), but can still be distinguished from both individual concepts. In particular, a DTS takes on a business-centric perspective and focuses on the transformation of products, services and business models (Matt et al. 2015), thereby separating itself from the IT strategy which is system-centric and exclusively technology-focused (cf. Teubner 2013), as well as the digital business strategy which describes future business opportunities without addressing the transformation to get there (cf. Bharadwaj et al. 2013).

Against this backdrop, DTS play a crucial role in guiding an organization’s digital transformation journey, and in turn, shape its transformation process and (intermediate) outcomes (Matt et al. 2015). However, these influences have not been investigated in-depth yet (Matt et al. 2015; Mitroulis and Kitsios 2019), with existing studies focusing exclusively on transformation starting points. For instance, in the context of digital transformations toward becoming a DDO, Fischer et al. (2023) find that top managers tend to initially focus on certain DDO dimensions to reduce the complexity of the transformation process. According to their study, top managers either choose a foundation-oriented starting point (centered around data-sourcing & sensemaking, data capabilities, and data-driven culture) or outcome-oriented starting point (centered around data-driven decision making, and data-driven value creation) depending on their understanding of a DDO and their motivation to have their organization become a DDO.

To further investigate the influence of DTS on transformation processes and outcomes, the coordination of business and operational activities—which Matt et. al (2015) identify as an important function of DTS—is of particular relevance. In this context, top managers need to coordinate and balance the “exploration of new [data-driven] possibilities and the exploitation of old certainties” (March 1991, p. 71). According to March (1991), these two activities are fundamentally different, as exploration includes experimentation, risk taking, and innovation, whereas exploitation relies on refinement, efficiency, and execution. Consequentially, both activities “require fundamentally different structures, processes and strategies” (Hughes 2018, p. 2) while competing for the same scarce resources (March 1991), making it very difficult to reconcile and balance them in one organization (March 1991; O’Reilly and Tushman 1996). Nonetheless, research shows that firms need to be capable of both, exploitation of ongoing activities as well as exploration of new value creation mechanisms to sustain competitive advantages (He and Wong 2004; March 1991; Raisch and Birkinshaw 2008). When examining how organizations navigate this tension, Duncan (1976) and March (1991) found two approaches: *structural* and *contextual ambidexterity*.¹

¹ Literature also identifies other, less common ambidexterity types. However, as these are not suitable for our focus on organizations (e.g., managerial ambidexterity; cf. Mom et al. 2009) and digital transformations (e.g., sequential ambidexterity; cf. Gupta et al. 2006), we decided to not introduce them here.

A *structurally ambidextrous organization* separates its explorative and exploitative activities structurally by implementing them in distinct organizational divisions, “each with different management, processes, structures, and cultures, but [...] well integrated under a senior management team” (Zaidi and Othman 2015, p. 23; cf. Duncan 1976; O’Reilly and Tushman 1996). This approach is in line with Christensen (2008), who argues that large, incumbent organizations should maintain dedicated divisions that focus on innovation to not get disrupted by innovative market entrants. In order to prevent an isolation of individual structures, which occasionally results from this approach (He and Wong 2004), top managers play a crucial role. According to Tushman and O’Reilly (1996) and Zaidi and Othman (2015), these top managers need to commit to ambidexterity and effectively communicate a consistent vision to all divisions, while taking individual divisional needs into consideration.

A *contextually ambidextrous organization*, in contrast, implements explorative and exploitative activities in the same organizational division, and focuses on enabling and encouraging its employees to dynamically and flexibly divide their time between exploitative and explorative activities (Birkinshaw and Gibson 2004; Zaidi and Othman 2015). Consequentially, contextual ambidexterity is viewed rather as a meta-level capacity of individual employees, and both exploration and exploitation emerge from the collective effort of all individuals (Zaidi and Othman 2015). Following this understanding, the role of top managers for this approach is to provide an organizational context, culture and environment that encourages employees to engage in both activities (Birkinshaw and Gibson 2004).

In summary, organizations are undertaking digital transformations to adapt their products, services, and business models to today’s data-centric era, with one objective of such a digital transformation being to become a DDO. To govern such a transformation, top managers develop and implement a DTS. One important aspect of such a DTS is coordinating and balancing ongoing business activities (exploitation) with innovation (exploration). In this context, organizations engage in different types of organizational ambidexterity, which is why we use this concept as a theoretical lens to differentiate between different DTS.

Research Approach

To address our research question, we relied on the case study method and extensively studied two organizations that are currently undertaking digital transformations toward becoming a DDO using different ambidexterity approaches. This research method, which is very common in IS research (Palvia et al. 2015), is appropriate for our study in particular for three reasons. Firstly, the case study method aims at exploring multifaceted, contemporary phenomena within their natural context, with the phenomena and their contexts not being clearly distinguishable or separable (Klein and Myers 1999; Yin 2013). This applies to our case subject, as the digital transformation process is inherently deeply anchored within its organizational context. Secondly, the case study method thereby focuses on examining processes (Orlikowski and Baroudi 1991) such as the digital transformation process in focus, and thirdly aims at answering “How” and “Why” questions (Walsham 1995; Yin 2013), such as our research question.

In line with Eisenhardt’s (1989) process of building theory from case studies, we will first describe our case selection criteria and briefly introduce the two case organizations. Next, we will provide an overview of the data collection process and instruments, and finally elaborate on how we analyzed the collected data.

Case Selection

As selecting appropriate cases is a crucial step for case study-based theory building (Eisenhardt 1989; Yin 2013), we established several case selection criteria. Primarily, in line with Eisenhardt (1989), we relied on theoretical sampling and chose our cases for theoretical reasons (Glaser and Strauss 1998). To better contrast the different approaches, we deliberately selected two organizations that pursue DTS characterized by fundamentally different organizational ambidexterity approaches. Our first case organization Insurance, a leading national insurance company, follows a structural ambidexterity approach and strategically founded a small subsidiary that focuses on data exploration to develop data-driven insurance products and new business models. This subsidiary serves as a pioneer that leads the digital transformation through innovative data use cases, with the remaining organization following suit at a much slower pace. In contrast, our second case organization Pharma, a global pharmaceutical company, decided against an organizational separation and follows a contextual ambidexterity approach. This organization sees the workforce in its entirety at the center of its digital transformation. Consequently, its top managers focus on upskilling and

culture change initiatives across the whole organization to enable their employees to individually perform both, explorative and exploitative activities.

Next to those theoretical selection criteria, both organizations are well-established European organizations with an annual revenue over five billion Euro and have been undertaking a digital transformation toward a DDO for several years. Thereby, the chosen cases remain comparable, while providing instances of polar types (Eisenhardt 1989). Table 2 provides a more detailed overview of both organizations.

Case information	Case	
	Insurance	Pharma
Headquarters	Europe	Europe
Revenue, in billion EUR	5-20	20-50
Employees, in thousand	5-20	50-100
Beginning of transformation toward DDO	Mid 2010s	Late 2010s
Ambidexterity approach characterizing the DTS	Structural ambidexterity	Contextual ambidexterity
Table 2. Overview of analyzed organizations		

Data Collection

In line with Eisenhardt (1989), we combined multiple data sources to collect our data. In a first preparatory step, we conducted extensive online research to gather background information on our cases, such as company reports and press releases, press articles, and interviews (see Table 3). A first examination of these findings enabled us to get an initial understanding of the respective digital transformation strategies, journeys, and key roles. Building on this first understanding, we transitioned to our second and most important step, where we collected data through key informants.

When selecting our key informants, we deliberately focused on top managers, as they are in charge of organizational transformation and innovation (Garms and Engelen 2019), in particular when it comes to strategic decisions regarding exploration and exploitation (Carmeli and Halevi 2009). To identify those key informants, we chose a combination of purposive sampling and chain referral sampling. Initially, we applied a purposive sampling strategy, in which we selected interviewees based on a set of predefined criteria relevant to our study (Patton 2015). In particular, we selected employees with senior roles who oversee and shape their organization’s digital transformation, such as board members, heads of relevant departments, and digital transformation leaders. In the course of our interviews, we then gradually transitioned to chain referral sampling, as we leveraged the network of our interviewees to refer us to other relevant key informants (Biernacki and Waldorf 1981) that we were unable to identify from an external perspective (Pan and Tan 2011). In doing so, we made sure to include a broad range of profiles and perspectives to have our sample represent “a variety of voices” (Myers and Newman 2007, p. 22). This also entails that for the case with structural ambidexterity (Insurance), key informants from both the explorative organizational unit (Board Member, Data Analytics Manager, and Technology Manager) and the exploitative organizational unit (Head of Data Analytics, and Head of Digital Services) were interviewed. Table 3 presents an overview of our key informants.

All interviews were requested via email and conducted using a semi-structured interview guide derived from our initial online research as well as our theoretical foundations (in particular the conceptual DDO framework from Fischer et al. (2022)). Moreover, each key informant was also asked questions that are specific to their tenure and position (Myers and Newman 2007). In total, we conducted eight interviews lasting between 30 and 90 minutes, thereby returning up to three times to individual key informants to discuss analysis results. Additionally, we were also able to access audio recordings of extensive interviews with four key informants regarding their digital transformation (e.g., from expert podcasts) with an average length of 30 minutes and two industry summit presentations from key informants with an average length of 26 minutes. To ensure the completeness and accuracy of our findings, all recordings were transcribed (Walsham 1995), resulting in ca. 140 pages of transcripts plus additional handwritten notes. As some interviews were conducted in German, we translated relevant sections to English for further processing.

Source	Case	
	Insurance	Pharma
Key informants	Board Member ^{A, I} Head of Data Analytics ^I Head of Digital Services ^I Data Analytics Manager ^{I, A} Technology Manager ^I	Digital Leadership Team Member ^A Division Head of Transformation ^{I, I, I} Division Head of Data Science ^P Head of Data Governance ^A Digital Transformation Expert ^P
Other case material	Annual company reports Company press releases Company website Press articles & interviews Company brochure Industry Case Study Trade Magazine Case Study	Annual company reports Company press releases Company website Press articles & interviews Transformation Image Video
<i>I: directly conducted interview; A: existing audio recording of an interview (e.g., podcast); P: presentation at industry summit</i>		
Table 3. Overview of collected data		

As outlined in Eisenhardt’s (1989) process of building theory from case studies, the data collection was a highly iterative process, as findings from our preparatory online research and early interviews were used to guide consecutive interviews to focus on emerging patterns while ensuring a holistic coverage of both cases. Ultimately, this approach also helped us to determine when to conclude our data collection based on theoretical saturation (Glaser and Strauss 1998), which Eisenhardt (1989) refers to as reaching closure.

Data Analysis

In parallel to our data collection, we already initiated our data analysis to fully leverage the flexibility of the case study method (Eisenhardt 1989). In doing so, we applied several strategies to organize and analyze our case data and address our research question. To establish a cohesive narrative that captured the chronology and considerations regarding the respective digital transformation strategy, process, and (intermediate) outcomes, we first pursued an extensive within-case analysis. This involved documenting our insights using a variety of tools such as organizational charts, timelines, and Gantt-charts. These visualizations helped us to connect key triggers, events, decision points, and results of the respective transformation journey. Additionally, we relied on deductive concept coding based on the conceptual DDO framework that Fischer et al. (2022) developed. In doing so, we used the five DDO dimensions contained in this conceptual framework (data sourcing & sensemaking, data capabilities, data-driven culture, data-driven decision-making, and data-driven value creation) as categories to capture in particular the transformation outcomes (i.e., the current transformation state of the organization). By building on this intermediary step, we created detailed, descriptive write-ups of the transformation context, process and (intermediate) outcomes of both cases, as recommended by Eisenhardt (1989). Finally, we transitioned to a cross-case analysis, where we compared and contrasted our two cases to identify overarching patterns and differences. In doing so, we highlighted the differences in the respective transformation processes and (intermediate) outcomes along the DDO dimensions, and additionally noted advantages and disadvantages of the two DTSs that emerged during our cross-case analysis.

To ensure the reliability and validity of our analysis results, we employed several techniques of data triangulation (Merriam 1998; Stake 1995; Yin 2013). Firstly, we compared our findings across different sources, to identify discrepancies or inconsistencies. Secondly, we sought feedback from other researchers and experts in the field to evaluate our coding and ensure that our interpretations were accurate and appropriate. Finally, we performed what could be described as member checking (cf. Creswell 2001; Lincoln and Guba 1985), as we shared findings from early interviews with key informants in interviews at a later stage to validate our interpretations and ensure “that the participants’ own meanings and perspectives are represented and not curtailed by the researchers’ own agenda and knowledge” (Tong et al. 2007, p. 356).

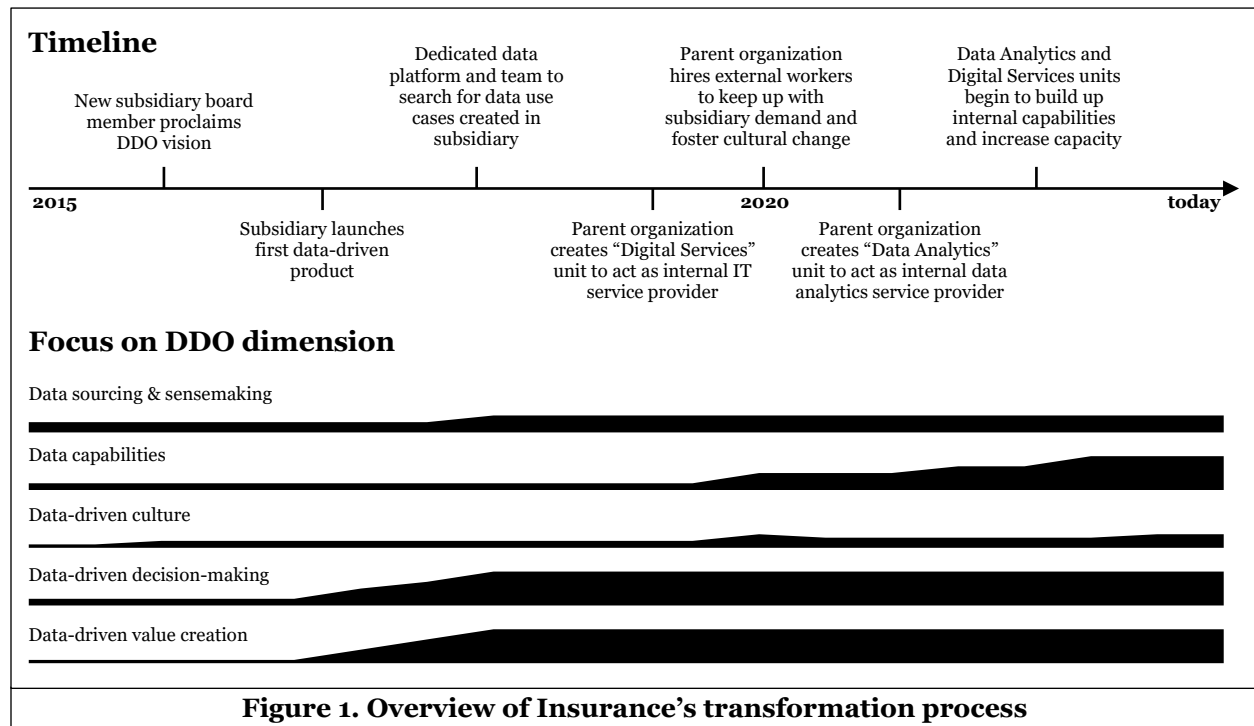
Results

Digital Transformation Strategy of Insurance

Context

Insurance is a national insurance company based in Europe, which has been offering insurance products and services focused on car insurance to millions of customers since the early 20th century. In doing so, the insurer strategically focuses on competitive pricing and high customer satisfaction. For this reason, the company decided to build up a direct insurance division in addition to its traditional broker and advisor network in the early 2000s. This division was spun off as a small subsidiary that focuses exclusively on direct insurance sales through their website, outsourcing all secondary processes (i.e., administrative business functions) to the parent company. This exclusive focus on digital channels, combined with the small organizational size of few dozen employees quickly made the direct insurance division become the digital pioneer of the insurance group. Even in the early years of this pioneering subsidiary—before Insurance embarked on its journey toward a DDO—important contextual prerequisites can be noted along the conceptual DDO framework of Fischer et al. (2022). Being an insurance company, Insurance has relied on customer and market *data sourcing & sensemaking* from early on to optimize its statistical models and with them its products (Head of Data Analytics). Particularly in the parent company, however, this data was initially only used in the form of monthly reports as a basis for *data-driven decision-making* (Data Analytics Manager). In the pioneering subsidiary, in contrast, the higher level of customer interaction allowed for a greater abundance of data and greater room for innovation. Consequentially, employees of the pioneering subsidiary began early on to search their data assets for opportunities for *data-driven value generation*. To do so, however, they were still using more traditional *data capabilities* such as statistical analysis software (Head of Data Analytics). Benefiting from this strong digital focus from the outset and the small group of employees, the pioneering subsidiary internally quickly established a *data-driven culture* that embraced data right from the start. According to a current Board Member, the subsidiary back then was built on the “belief in digitalization, and in technological progress.” In contrast, the parent company, from which a large proportion of the digital experts were drawn to the pioneering subsidiary, remained with a traditional corporate culture.

Digital Transformation Process



As depicted in Figure 1, the actual digital transformation—which would go on to redefine the self-conception of Insurance—began at the pioneering subsidiary. When Board Member, a seasoned insurance executive with experience in digital marketing was appointed to the board of the subsidiary, he proclaimed a new, clear vision. According to him, future “customers [would] compare their customer experience not with that at other insurance companies, but instead with their experience at companies with digital marketing and sales as a core competency, such as e-commerce” (Board Member). In his view, only a similarly data-driven and automated insurance organization could live up to this level of customer expectation. To this day, this vision is the aspirational target of Insurance’s digital transformation, with particularly the leadership team and employees of the pioneering subsidiary deriving all decisions from it.

From the very beginning, the transformations core team was determined to drive the digital transformation in an outcome-oriented way, as “in the end, it’s the use cases that bring benefits. Creating the perfect foundation is a pipedream that many companies chase, but you’ll never get done with this” (Data Analytics Manager). As a further reason for this need for rapid innovation, Board Member cites the high competitive pressure from market entrants such as startups or expanding car manufacturers, as “the insurance products sold directly are rather simple and therefore there are fewer major barriers to market entry” (Board Member). A decisive step in this direction was the development of an innovative data-driven insurance product in which the car insurance costs depend on the driving style. The pioneering subsidiary was thus able to demonstrate *data-driven value creation* for the first time at the end of the 2010s.

Driven by the success of this use case, the leadership of Insurance decided to adequately invest in its *data capabilities* in the late 2010s. As part of a comprehensive transformation program, the insurer set up a new data infrastructure as well as new organizational structures. In this context, the division of work between the pioneering subsidiary and the parent company was regulated. The subsidiary was to remain limited to a small number of employees and focus exclusively on innovation in the form of exploration of new data use cases. The parent company, on the other hand, was to act as a service provider and therefore build up the capabilities and resources required for the development of data use cases in the subsidiary. To do so, two units named “Data Analytics” and “Digital Services” were newly established in the parent company. Following a hub-and-spoke principle, these two units were to pool competencies and, in return, send experts into cross-functional, virtual teams where they would collaborate with representatives of the pioneering subsidiary to implement data use cases.

However, with this organizational change, cultural tensions became apparent, as tenured employees of the parent company could not relate to the pioneering subsidiary’s *data-driven culture* and its new operating model. “There was a lot of cultural resistance, not necessarily at the board level, but you could feel it very strongly at the levels below.” (Board Member). As a short-term solution, at least for the new units that heavily interacted with the subsidiary, the parent company brought in a considerable number of external experts who brought the right *data capabilities* and *data-driven culture* with them. This led to a short-term uptick in both mentioned dimensions, as can be seen in Figure 1.

Intermediate Digital Transformation Outcomes

Today, this dichotomy between the explorative orientation of the subsidiary and the exploitative orientation of the parent company is more visible than ever before. The subsidiary has a reputation as an innovation leader in its industry, as can be demonstrated along several DDO dimensions. When it comes to *data-driven decision-making*, key performance indicators (KPIs) are deeply anchored in the subsidiary’s decision processes, and critical KPIs are updated multiple times per day, according to the Data Analytics Manager. “With us, it’s really the case that numbers beat everything. Even if everyone thinks A is great, but our customers don’t think it’s great, as reflected by the numbers, it’s not great. Then nothing helps. And that’s where we are very, very advanced” (Data Analytics Manager). At the same time, the subsidiary has a lot of flexibility in ideating and experimenting new explorative use cases for *data-driven value creation*, such as customer journey improvements like individualized price calculators. Finally, the subsidiary’s reputation further fosters its internal *data-driven culture*. “People who apply to us know exactly what they are signing up for, and I only hire people with a fitting mindset” (Board Member).

On the other hand, most of the parent organization still remains in its traditional organizational structure, processes, and culture, and primarily focuses on taking over selected, successful data use cases such as price calculators from the pioneering subsidiary. Against this backdrop, the Board Member admits, he “underestimated how persistently [the parent organization] clings to its old structures.” Nonetheless,

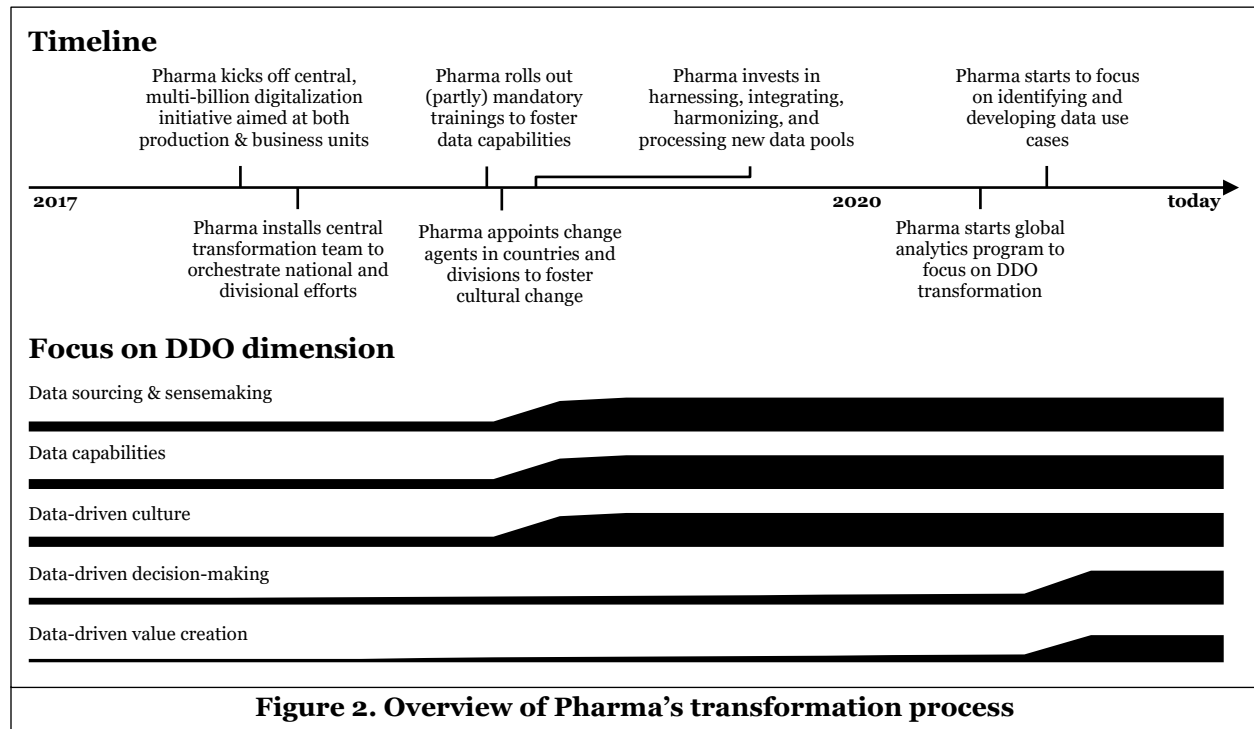
within the two newly established data technology units, *data capabilities* are increasingly being built up internally as well, although the share of external workers is still at about 40% (Head of Data Analytics). Finally, the *data sourcing & sensemaking* dimension gradually improves, with new data sources being added and integrated on an ongoing basis.

Digital Transformation Strategy of Pharma

Context

Pharma is a global pharmaceutical and healthcare company based in Europe that has been engaged in the research and development, production and distribution of medications and vaccines since many decades. As typical in the industry, the company draws much of its competitive advantage from extensive research & development efforts. Accordingly, Pharma’s history has been shaped by mergers and acquisitions of other pharma companies, in order to get hold of their knowledge and patents. According to Pharma’s strategic vision, complex medicines will become even more important in improving people’s health worldwide, driven by increasing advances in medical science and innovation. To keep pace with this shift, the organization initiated a holistic, multibillion transformation project in the late 2010s, aiming at digitizing both the production and the business side of Pharma (Digital Transformation Expert). A core objective of this digital transformation was to become a DDO, with the goal of “increased product and operational efficiency and reduced costs” (Digital Transformation Expert) at the production side, and “more customer-centric commercial processes” (Division Head of Transformation) on the business side. In doing so, the company was able to build on existing groundwork regarding *data capabilities* and *data-driven culture*, with the Division Head of Transformation stating, “we have always heavily relied on data.” Operating in a very research-focused and knowledge-intensive industry, its employees were inherently highly qualified and affine to working data-driven. However, in particular advances in the direction of *data-driven value creation* were not centrally coordinated or directed. “Everybody was kind of developing their own little solution, every country would have a different approach” (Digital Leadership Team Member). Additionally, “use cases were not derived from strategy, but instead just rolled out and then people tried to retrofit a business case afterwards” (Division Head of Transformation).

Digital Transformation Process



As summarized in Figure 2, Pharma's leadership decided on a holistic, organization-wide approach to implement its digital transformation toward becoming a DDO, as "you really need to have a global scalable solution. You cannot build value on a disseminated system. So, the global, scalable solution aspect is critical" (Division Head of Transformation). Consequently, the organization established a global transformation team that centrally establishes and shares transformation objectives, guidelines, and best practices to be implemented consistently by national managers and transformation experts (Division Head of Transformation).

To build on the company's strengths, the central transformation team initially focused on expanding their *data capabilities* and *data-driven culture*. For them, taking their employees with them on their journey toward becoming a DDO "from day zero" was seen as critical to success, and particularly a data-driven culture was considered the "holy grail" to a successful digital transformation (Division Head of Transformation). In this spirit, Pharma aimed to upskill its existing workforce to build up future core competencies in-house, as "it's critical to our business; that talent has to come from within the company, insiders" (Digital Leadership Team Member). Following this understanding, extensive and partly mandatory trainings for all employees and managers were introduced at an early stage to foster both data literacy as a part of *data capabilities* and a *data-driven culture*. In addition, so called change agents were installed in the individual business units to anchor the transformation in the local context using their personal networks. In this context, a Division Head of Transformation states "on the one hand, managers must of course ensure that people work in a more data-driven way and create a certain psychologically safe space for this, and on the other hand, it is also important that we create a peer-to-peer exchange so that employees can tell their peers, what it was like to be part of the project or how they used which use cases in their daily business."

Concomitantly, Pharma invested extensively in the availability, quality, and integration of data to improve *data sourcing & sensemaking*, with a Digital Leadership Team Member describing their considerations as follows: "We want the data to be the right data, to have the right quality of data, to be meaningful. The first part of the transformation is really to [...] make sure we have consistent data flow, that we create the right set of data, and we are going to be able to use it."

Awaiting these DDO foundations, the development of data use cases for *data-driven decision-making* and *data-driven value creation* was initially deferred and is only now, after several years, slowly picking up speed, with the Division Head of Transformation stating, "we have analyzed what our strategic cornerstones and our must-win battles are. On this basis, we defined an initial list of use cases, which we then packed into a roadmap, a timeline, and which we are now implementing step by step."

Intermediate Digital Transformation Outcomes

According to our case data, Pharma has largely managed to establish contextual ambidexterity in its workforce. When reflecting on the *data-driven culture* at Pharma, the Division Head of Transformation states, "if you look at the response of the organization to what we are doing, we have already achieved a lot in terms of people understanding what we are doing and why we are doing it" and cites a high adoption rate of data tools. In a similar vein, a Digital Transformation Expert describes considerable progress regarding *data capabilities*, citing cloud infrastructure and machine learning toolsets. Also, in terms of *data sourcing & sensemaking*, a Digital Leadership Team Member expresses his satisfaction with the progress of the transformation, stating "now we have all this flow of data in a consistent way. Now we are really in our way to make a lot of sense of this data. We have several projects really to make sense of those data."

Despite those advances, however, Pharma has not yet created much data use cases for *data-driven decision making* or *data-driven value creation*. "We are rather at the beginning. We have developed the first use cases, but I would say the journey has only just begun" (Division Head of Transformation). As primary reason for this delay, the Division Head of Transformation states that "it is really difficult to build and coordinate use cases at scale."

Cross-case Analysis

By comparing and contrasting our two cases, it becomes apparent that the two DTS characterized by different organizational ambidexterity approaches have different influences on the process and (intermediate) outcomes of both organization's transformations toward becoming a DDO.

When it comes to the *transformation process*, the DTS characterized by structural ambidexterity that Insurance followed, led what could be described as a two-speed approach. Due to its inherent affinity for innovation, the exploration-oriented pioneering subsidiary was declared the spearhead of the transformation by Insurance's top managers and has thus been undergoing a considerably accelerated transformation since. Due to its small scale, the pioneering subsidiary initially focused in particular on simple data use cases that could generate data-driven value or enable data-driven decision-making without the need for extensive data capabilities or business interfaces. In contrast, the parent company has been undergoing the transformation process much more slowly due to its exploitation-oriented, entrenched processes and structures. In fact, the transformation process there only gained momentum with the increasing amount of data use cases developed by the pioneering subsidiary and the associated demand for more resources and more sophisticated data capabilities. The transformation gap created by the two different speeds was handled differently during the transformation. Specifically, the initial lack of resources and data capabilities in the parent company were acquired externally on a temporary basis. In contrast, the emerging cultural divide between the two organizational units has not been addressed yet.

In comparison, the DTS characterized by contextual ambidexterity that Pharma followed led to a much more centralized and unified transformation process orchestrated by a global transformation team. As Pharma aimed to have both exploitative and explorative activities carried out by all employees, it focused from the outset much more strongly on a broad-based transformation. This included an expansion of data sourcing & sensemaking, as well as the development of data capabilities and a data-driven culture at scale to further enable and encourage employees for explorative activities. Due to the scale and diversity of the organization to be transformed, this process has been taking considerably longer, resulting in a broader but less advanced transformation in the same time span compared to Insurance's DTS. Notably, this led to use case ideation and development being initiated at a much later point in the transformation journey, delaying data-driven decision-making and data-driven value creation.

Similarly, the two different DTSs show considerably different results in terms of *transformation outcomes*. Insurance, which focused on achieving rapid transformation progress at a small organizational unit, demonstrates in particular those DDO dimensions to a great extent, that can be obtained at a small scale. For instance, the data use cases that were developed in the pioneering subsidiary were subsequently implemented in the parent company and have since enabled organization-wide data-driven decision-making and data-driven value creation. However, Insurance is behind Pharma regarding the dimensions of data capabilities and, in particular, data-driven culture, as these two dimensions were initiated at a later point in the transformation for a majority of the organization (i.e., the parent company).

In contrast, Pharma's contextual ambidexterity-based DTS results in the organization having built significantly more data capabilities and data-driven culture. This led to a deeper integration of business and data knowledge on the individual level and a significantly higher acceptance of the transformation among employees. Similarly, the earlier initiated transformation of the data landscape led to a more sophisticated and encompassing data sourcing & sensemaking. However, in the absence of a dedicated exploratory unit, data use case development has not been as much of a focus, which is reflected in the low demonstration of data-driven decision-making and data-driven value creation.

As shown in Table 4, both DTS offer different advantages and disadvantages for the actual transformation. According to our data, the choice of DTS is therefore particularly dependent on the transformation priorities of top managers. Insurance operates in a saturated, fast-moving market with low entry barriers due to the simplicity of its insurance products. Consequentially, due to the threat of competition from startups or car manufacturers, the company is under high pressure to innovate rapidly. Accordingly, its top managers decided on a DTS characterized by structural ambidexterity, as this strategy particularly benefits rapid transformation outcomes. In contrast, Pharma operates in a considerably more knowledge-intensive, slow-moving market with high entry barriers due to the product complexity. In consequence, top managers choose a DTS characterized by contextual ambidexterity to reconcile exploitation and exploration on the employee level and thereby allow for more sophisticated use cases at a later point in time.

	Digital Transformation Strategy (characterizing organizational ambidexterity approach)	
Influence	Insurance (structural ambidexterity)	Pharma (contextual ambidexterity)
Transformation Process	Rapid, outcome-oriented transformation of explorative organizational unit and in parallel slower, trailing transformation of exploitative organizational unit, inspired by achievements and demands of the former	Centralized and unified transformation of entire organization focusing on reconciling exploitation and exploration on the individual level to establish DDO foundation with subordinate focus on transformation outcomes
(Intermediate) Digital Transformation Outcomes	<i>Strongly demonstrated</i> data-driven decision making data-driven value creation <i>Less strongly demonstrated</i> data sourcing & sensemaking data capabilities data-driven culture	<i>Strongly demonstrated</i> data sourcing & sensemaking data capabilities data-driven culture <i>Less strongly demonstrated</i> data-driven decision making data-driven value creation
Implications on Rapid outcomes of transformation Sophistication of data use cases Transformation coordination effort Workforce support	+ Independent, dynamic organizational unit dedicated to exploration – Initial lack of extensive capabilities and integration into business units + Initial focus on smaller explorative organizational unit – Cultural tensions between units with different transformation progresses and thus different self-conceptions	– Initial focus on DDO foundations delays data use case development + Integration of business and data knowledge on individual level – Coordination of organization-wide transformation necessary + Integration of exploitation and exploration on individual level fosters willingness for organizational change
<i>Advantages: +; Disadvantages: –</i>		
Table 4. Summary of DTS influences on digital transformations toward a DDO		

Discussion

Organizations are increasingly developing and implementing DTS to adapt their products, services, and business models to today’s data-centric world, and in this context become DDOs. To better understand how DTS influence digital transformation outcomes and processes, we conducted two in-depth case studies on organizations undertaking such transformations, using organizational ambidexterity as a theoretical lens. In doing so, the paper at hand set forth to answer the following research question: *How do different digital transformation strategies influence the transformation process toward a DDO and its (intermediate) outcomes?*

According to our empirical findings, DTS based on different organizational ambidexterity approaches lead to different digital transformation processes and outcomes, with both strategies exhibiting specific advantages and disadvantages. Against this backdrop, the chosen DTS primarily depends on the responsible top managers’ priorities, mainly derived from their product and market understanding.

As with any research, the paper at hand is subject to several limitations that need to be kept in mind when discussing its contributions. First, it should be noted that both case studies are based on a limited number of key informants. This is due to the fact that only a limited number of top managers are involved in the design and oversight of an organization's digital transformation strategy and are therefore in a position to provide information. In order to nevertheless ensure a rich and well-rounded database, we supplemented

the interviews with extensive secondary sources such as company reports and press releases, press articles and interviews, and industry case studies. Going forward, these data could also be further enriched with the perspectives of more junior employees who are personally affected by the digital transformation.

Second, the selection of cases is also subject to limitations and associated research opportunities. To start with, it should be noted that we purposefully chose case organizations of different (industry) contexts to ensure industry-overarching generalizability of results. Complementing this perspective, a *ceteris paribus* comparison of organizations within the same industry would also be valuable. In a similar vein, to better contrast the DTSs, we intentionally selected organizations whose DTSs are clearly characterized by one particular ambidexterity approach. In practice, however, hybrid DTSs can also be found (cf. Iansiti and Lakhani 2014), and it could be worthwhile to investigate how the respective influences on the transformation process and (intermediate) outcomes interplay in these cases. Lastly, it would be worthwhile to examine cases with different combinations of DTS and transformation starting points such as organizations with contextual ambidexterity and an outcome-oriented starting point.

Third, our data indicates that different DTSs have different advantages and disadvantages, which are weighted differently depending on the context. Building on this, it would be instructive to further investigate the influence of the organizational context on top managers' DTS choices. Relatedly, it would be worthwhile to conduct a longitudinal case study to explore whether organizations continue with their respective organizational ambidexterity after becoming data-driven or whether this approach was primarily a means to become a DDO.

Finally, the paper at hand does not assess and compare the individual DTS in terms of their overall prospects of effectively transforming an organization into a DDO. To address this research gap, a qualitative comparative analysis (QCA; cf. Fiss 2011) based on a larger survey presents a promising research approach, as it allows researchers to find specific configurations of conditions that lead to effective or less effective digital transformations of organizations toward a DDO.

Research Contributions and Practical Implications

The paper at hand offers both, theoretical and, in particular, practical contributions. Regarding theoretical contributions, our work sheds light on how DTS characterized by different organizational ambidexterity approaches lead to different digital transformation processes and outcomes. Thereby, this study contributes to existing academic literature in the field of DDOs and DTS, as the transformation journey of organizations toward DDO has not been studied in its entirety (Berndtsson et al. 2018; Fischer et al. 2023) and in particular existing DTS literature currently lacks guidelines for organizations to build and implement DTS (Hess et al. 2020; Korachi and Bounabat 2020; Mitroulis and Kitsios 2019). At the same time, it confirms and expands on previous studies on transformation starting points toward a DDO. In line with the findings of Fischer et al. (2023), our data shows that top managers have their organizations embark on their transformation journey toward a DDO by either prioritizing transformation foundations (focusing on data sourcing & sensemaking, data capabilities, and data-driven culture), or the transformation outcomes (focusing on data-driven decision-making and data-driven value creation), based on their motivation for implementing a DDO transformation. In addition, our case study results indicate that a DTS characterized by structural ambidexterity is particularly suitable for an outcome-orientation transformation starting point, as it benefits the outcome-oriented DDO dimensions. Likewise, a strategy characterized by contextual ambidexterity approach is particularly suitable for a foundation-oriented transformation starting point, as it primarily benefits foundation-oriented DDO dimensions.

Primarily, however, the paper at hand offers five main *practical contributions* that guide top managers along their journey of crafting and implementing their digital transformation toward a DDO. First, our paper provides top managers with an overview of options on how to implement digital transformations based on organizational ambidexterity. In particular, companies can organizationally separate their explorative activities from their exploitative activities through a pioneering subsidiary (structural ambidexterity), or they can focus on enabling their employees to flexibly and dynamically do both, exploitative and explorative activities in the same organizational unit (contextual ambidexterity).

Second, based on this set of options, our paper helps top managers understand the advantages and disadvantages of the respective DTS. As shown in our Insurance case, a DTS characterized by structural ambidexterity allows companies to rapidly develop transformation outcomes in the form of less

sophisticated data use cases while having comparably low coordination efforts. However, this DTS does not foster data capabilities, data-driven culture, and data sourcing & sensemaking across the entirety of the organization. As the transformation progresses, this can lead to resource bottlenecks and tensions between organizational units. In contrast, a DTS characterized by contextual ambidexterity avoids these specific pitfalls as it transforms the organization in a uniform way. In doing so, it also promotes a deeper integration of existing business models and new, data-driven opportunities as the same employees engage in both exploitative and exploratory activities. However, due to its scope, this type of DTS takes more time and coordination efforts to implement, thereby delaying transformation outcomes such as data use cases.

Third, to weigh those advantages and disadvantages, our paper helps top managers reflect on their priorities. As emerged in our two use cases, in particular external market conditions and product complexity are decisive factors to be considered by top managers. Organizations like Insurance, which find themselves in competitive markets with low barriers to entry and products of low complexity, can gain rapid competitive advantages through a DTS characterized by structural ambidexterity. In contrast, companies like Pharma, which find themselves in slowly moving, knowledge-intensive industries with high barriers to entry can achieve more sophisticated and complex data use cases through a deeper and broader integration of data technologies into their ongoing business through a DTS characterized by contextual ambidexterity.

Fourth, and as already mentioned in our theoretical contributions, this paper helps top managers to implement the chosen strategy by identifying suitable transformation starting points. In particular, outcome-oriented starting points (focusing on data-driven decision-making and data-driven value creation) are suitable for strategies characterized by structural ambidexterity, and foundation-oriented starting points (focusing on data sourcing & sensemaking, data capabilities and data-driven culture) are suitable for strategies characterized by contextual ambidexterity.

Fifth, and lastly, our work helps top managers identifying the mentioned disadvantages of the chosen DTS, thereby navigating risks such as the loss of support by workforce or management due to cultural tensions (structural ambidexterity) or lack of use cases to prove the value proposition of the digital transformation toward a DDO (contextual ambidexterity).

Conclusion

In conclusion, our study sheds light on how different DTS influence the process and (intermediate) outcomes of an organization's digital transformation toward becoming a DDO by analyzing two organizations undertaking such transformations. We find that DTS based on different organizational ambidexterity approaches lead to different digital transformation processes and (intermediate) outcomes, thereby offering different advantages and disadvantages. As a result, this study adds to the existing knowledge on DDO and DTS by investigating the transformation journey of organizations towards becoming a DDO, which has not been explored in its entirety before. Additionally, our paper provides practical guidance for practitioners to develop and implement a suitable DTS for their organization. Against this backdrop, we hope that our research will serve top managers as a helpful guide, as well as inform and inspire future research on the transformation journey of organizations toward becoming a DDO.

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