

Unpacking Digital Transformation Tensions through Workers' Perceptions: A Technological Frame and Paradox Theory Approach

Altus Viljoen
Technical University of Munich
altus.viljoen@tum.de

Leonard Przybilla
Technical University of Munich
leonard.przybilla@tum.de

Andreas Hein
Technical University of Munich
andreas.hein@tum.de

Anna Keilbach
Technical University of Munich
anna.keilbach@tum.de

Helmut Krcmar
Technical University of Munich
helmut.krcmar@tum.de

Abstract

This study proposes that actors' perceptions of digital transformation (DT), constructed through technological frames, can explain organizational tensions that firms experience during DT initiatives. We conducted a qualitative case study with a large manufacturer over 12 months, analyzing how different hierarchical employee groups' technological frames shape their perception of DT. The results illustrate that actors' perceptions of DT comprise three dimensions (reasons for DT, contributions to DT, and communication during DT initiatives), and how these perceptions explain four different organizational tensions in DT. We contribute to theory on DT by showing how classifying actors' perceptions of DT through technological frames and paradox theory enables an understanding of how organizational tensions in DT may originate on the individual level.

Keywords: Digital transformation, technological frames, organizational tensions, paradox theory

1. Introduction

Successfully implementing digital transformation (DT) is not a one-man show. DT is a comprehensive transformation process that goes beyond the mere implementation of specific technologies – instead changing the organizational identity of the entire organization (Wessel et al., 2021) – and touches multiple actors throughout the organization.

However, as DT concerns many different organizational actors, competing demands often exist between actors who aim to coordinate DT initiatives, leading to “organizational tensions” (Soh et al., 2019; Svahn et al., 2017). An example is prioritizing and exploiting existing “physical” product lines instead of

exploring new digital opportunities (Soh et al., 2019). This phenomenon has consistently reoccurred: from the infamous Kodak case study where the organization – ultimately to their demise – prioritized traditional over digital photography to more recent cases such as Volvo experiencing organizational tensions during the implementation of its Connected Car Initiative (Svahn et al., 2017).

To understand why organizational tensions in DT occur, extant literature follows two trends, forming the foundation for the research gap this study addresses. First, existing studies have predominantly focused on categorizing the “observable” tensions and identifying responses to such tensions (Gregory et al., 2015; Svahn et al., 2017) but do not elaborate upon the *drivers or higher-order theoretical characterizations* of these tensions in the DT context – i.e., what may theoretically explain the *cause of the tensions* in the first place. Second, with limited exceptions (Gierlich-Joas & Zimmer, 2023), studies have hitherto focused on the organizational level of analysis when investigating organizational tensions in DT (Soh et al., 2019; Wimmelius et al., 2021). Thus, although extant literature acknowledges that DT requires the *participation of different organizational actors* – which may lead to competing demands (Soh et al., 2019; Svahn et al., 2017) – the focus has not been to explain how organizational tensions manifest or originate on the *team or individual level*.

In this study, we propose that these two research gaps are related. We posit that the *root cause* of organizational tensions in DT can be better explained by drilling down to the actors on the lowest level of analysis: the *individuals* executing DT. Here, we specifically look to the work of Orlikowski and Gash (1994) to motivate this argument. In their seminal paper, the authors show how individuals' perceptions

about technology – so-called “*technological frames*” – impact how individuals within an organization make sense of, and give meaning to, technology in the context of their work. If individuals have conflicting perceptions and their technological frames are misaligned, it can lead to miscommunication, resistance, or failure in technology integration – which may explain the organizational tensions during DT.

Furthermore, we propose that conflicting perceptions may be even *more prevalent in the DT context* than in the context of specific technologies (the focus of Orlikowski & Gash’s work). DT is an *abstract phenomenon* not limited to a certain technology (Wessel et al., 2021) and requires new logic and thinking about technology (Yoo et al., 2010). Thus, this study investigates *how individuals’ perceptions of DT, constructed through technological frames, explain organizational tensions in the DT context*.

We employed an interpretative case study, justified by the need for an in-depth understanding of complex, context-bound phenomena to answer the research question (Yin, 2018). We integrated technological frames that provide a granular understanding of how organizational actors perceive and interact with DT with paradox theory that serves as an analytical tool for examining these conflicts when they manifest as paradoxical tensions (Soh et al., 2019). The single case study was executed within a large manufacturing firm involving participants from multiple hierarchical levels. This approach enables an empirical exploration of how individual perceptions of DT, shaped by their technological frames, contribute to organizational tensions. We analyzed these findings through the dual lens of technological frames and paradox theory to delineate broader implications and avenues for future academic inquiry.

Utilizing a two-step coding process, we first identify three critical dimensions of actors’ DT perceptions based on the domains of technological frames, which include the rationale for DT participation, the perceived role in DT initiatives, and the effectiveness of DT communication strategies. These dimensions are further analyzed through Smith and Lewis’ (2011) framework, revealing a multifaceted landscape of organizational tensions encompassing learning, belonging, performing, and organizing categories. The analysis captures a nuanced set of perspectives across various hierarchical levels, ranging from strategic imperatives for upper management to the practical implications for assembly line workers, thereby offering a holistic understanding of the complexities involved in organizational DT.

The study has several theoretical implications. First, integrating *paradox theory and technological*

frames offers a more nuanced understanding of how actors’ DT perceptions manifest in organizations. This integration allows a deeper exploration of the drivers and higher-order theoretical characterizations of organizational tensions in the DT context. Second, our study provides insights into paradoxical tensions on the *individual level* instead of literature that has only investigated such tensions on the organizational level. Third, our results provide insights into the *theoretical categorization of paradoxical tensions* in the DT context instead of the hitherto predominant characterization of “surface-level” phenomena. By doing so, we drill down to explain the root cause of organizational tensions in DT.

2. Conceptual foundation

2.1 Digital Transformation (DT)

A definitive definition of DT – along with DT’s relation to traditional IT transformation – has been a topic of study by many scholars (Riasanow et al., 2019). In this study, we opt for the definition of Wessel et al. (2021) in that DT shows two distinctive differences from traditional IT transformation. First, DT activities leverage digital technology in (re)defining an organization’s value proposition, while IT-enabled organizational transformation activities leverage digital technology in supporting the value proposition. Second, DT involves a new organizational identity compared to IT-enabled organizational transformation that enhances an existing one.

2.2. Technological frames

The first stream of literature we integrate for establishing perceptions of DT is “*technological frames*,” introduced by Orlikowski and Gash (1994). The authors explored how individuals within organizations make sense of and interpret information technologies: they argue that people construct frames of reference that shape their perceptions, understandings, and actions related to technology. Orlikowski and Gash (1994) found that individuals’ technological frames are characterized by three domains: *nature of technology* (what a technology is), *technology strategy* (why a technology is used), and *technology in use* (how a technology is used).

However, technological frames differ from this study’s focus in two ways. First, Orlikowski and Gash’s (1994) technological frames were derived based on implementing a single technology. We, however, are not interested in a single technology, but

rather in addressing the *abstract notion of DT as a collection of digital technologies, their potential, and usage*. Second, as they defined the technological frames largely before the “digital revolution,” we also considered whether utilizing them as is in the *digital context* made sense.

Accordingly, we reviewed literature employing technological frames in the DT context. For example, Nolte et al.’s (2020) context and aim correspond to our study in that the authors used technological frames to investigate different actors’ perceptions of DT in a manufacturing setting. Carlsson (2023) investigated technological frames’ role in understanding how and why managers’ perceptions of industrial digitalization affect strategizing organizational capabilities. Spieth et al. (2021) developed an instrument for measuring the dimensions of technological frames in the digital age. Thus, Orlikowski and Gash’s (1994) technological frames remain universal and relevant in the digital age.

We briefly define the three technological frame domains in Table 1, adjusted for the DT context.

Table 1. Technological frame domains, adjusted for DT (Orlikowski and Gash, 1994)

Technological Frame Domain	Description
Nature of DT <i>(“what”)</i>	Refers to the actors’ beliefs regarding the “core essence” of DT. It encompasses what DT entails, e.g., whether DT is a mere introduction of new tools or a fundamental overhaul of business operations.
DT strategy <i>(“why”)</i>	Refers to the perceived role and objective of DT within an organization. It touches on beliefs about the overarching strategic purpose of DT initiatives.
Executing DT <i>(“how”)</i>	Refers to perceptions related to deploying and utilizing digital strategies and tools. It covers the norms, practices, and potential challenges associated with integrating digital elements into everyday operations.

2.2. Paradox theory

Paradox theory is an established approach focused on understanding how firms can *simultaneously* address organizational tensions: it rests on the assumption that while choosing among tensions might aid short-term performance, long-term resilience requires continuous efforts to meet multiple, divergent

demands (Lewis, 2000) and has been well-established in the IT and DT contexts. From the paradox theory literature in the IT and DT contexts, we describe four overarching theoretical concepts that aid our understanding of organizational tensions: (i) *tension types*, (ii) *theoretical categories*, (iii) *tension drivers*, and (iv) *managerial responses* (Viljoen et al., 2022). Figure 1 shows this synthesis of the theoretical landscape of paradox theory in the IT and DT contexts.

Tension types refer to the observable phenomena organizations first encounter on the “surface level.” Tension types have been well-established in the literature, both in the IT and DT contexts (Gregory et al., 2015; Soh et al., 2019; Svahn et al., 2017; Toutaoui et al., 2022; Wimelius et al., 2021). For example, in the DT context, Soh et al. (2019) identified a business-to-business (B2B) vs. business-to-consumer (B2C) tension, in which a new B2B-B2C business model may attract B2C customers but simultaneously devour profitable B2B revenue streams.

Like tension types, *theoretical categorizations* also classify tension types but do so on a higher level of abstraction. Here, we note four categorizations as identified by Smith and Lewis (2011). We list them below in Table 2 and then explain how these theoretical categorizations can be used to make sense of “surface-level” tensions in different ways.

Table 2. Theoretical categorization of tensions (Smith and Lewis, 2011)

Theoretical Categorization	Description
Performing	Tensions that arise from the plurality of stakeholders, resulting in <u>competing strategies and goals</u> .
Organizing	Tensions that arise as complex systems in the organization create competing designs and processes to achieve a desired outcome.
Learning	Tensions that arise as the firm changes, renews, and innovates. They require employees to acquire new or different competencies (“destroying the past to create the future”).
Belonging	Tensions that arise due to the relationship between the individual and the collective (conflicting and competing values, roles, and memberships).

Continuing the B2B-B2C tension example (Soh et al., 2019), the *performing* categorization refers to the company’s target market where it needs to manage competing demands in its financial performance – i.e., not alienating B2B customers while simultaneously

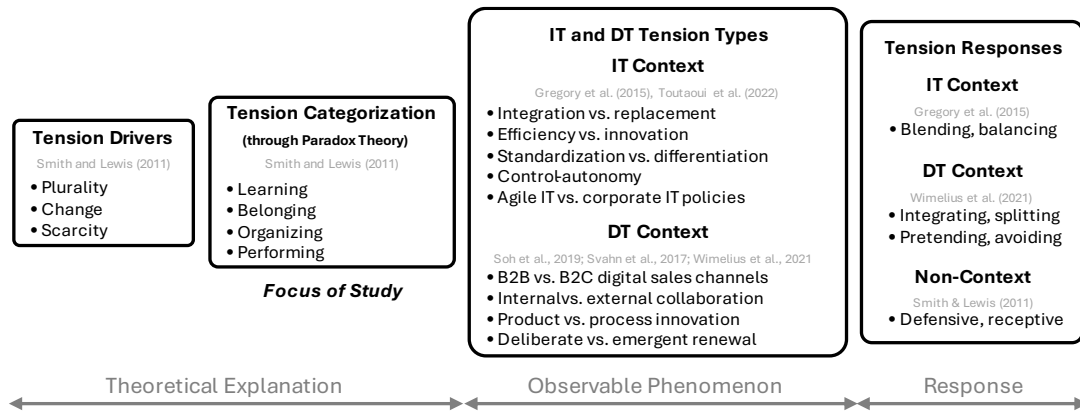


Figure 1. Overview of organizational tension and paradox theory literature (Viljoen et al., 2022)

attracting B2C customers. *Organizing* refers to the firm’s internal process and structures – i.e., how it executes multiple strategies – and thus concerns the tensions between existing B2B systems/processes and those needed to manage the B2C business. *Learning* refers to the new skills that employees must learn and thus relates to employees’ competencies to execute B2B and B2C strategies. From a *belonging* perspective, the company’s identity conflict arose as it shifted from a B2B to an omnichannel company. While this theoretical categorization of tensions is the focus of this study, we briefly highlight two remaining theoretical concepts in paradox theory literature.

Tension drivers are the most abstract concept and precursor to the theoretical categorizations of tensions. Smith and Lewis (2011) note three drivers: change, plurality, and scarcity. For example, *change* fundamentally spurs tensions and can manifest in a need for change in learning, organizing, etc.

Lastly, scholars have also extensively studied *managerial responses* to tensions. For example, in the B2B-B2C example, Soh et al. (2019) note that the organization followed a *receptive* response for some tension categories while following a *defensive* response for others.

3. Research design

As DT is a dynamically evolving phenomenon, we employed a qualitative, interpretive research approach (Walsham, 1995). We conducted a single case study, which assisted us in explaining and structuring DT and in providing rich insights into why some relations in the DT context can be observed (Eisenhardt & Graebner, 2007; Yin, 2018). For our case partner, we selected an established, large original equipment manufacturer (OEM) that is part of an ongoing research project. We especially considered two factors that make the case partner appropriate for

our study. First, as extant literature on organizational tensions focuses on large/established firms (Svahn et al., 2017), our case partner offered the potential to deliver comparable insights. This not only enhances the comparability of our insights with extant literature but also increases our chances of finding organizational tensions and disparate technological frames, as large organizations typically contain distributed actors in hierarchical structures. Second, the firm’s traditional business concerns physical goods (i.e., not “digital native” firms) and has active DT initiatives running with the concrete intention to “digitally transform.” Over the course of 12 months, we worked closely with the case partner to gain insights into their ongoing DT efforts and to obtain the different perspectives of employees in the organization. We collected data from five different sources, summarized below in Table 3.

Table 3. Data collection overview

Data Source	Description
DT strategy documentation	Reviewing of several internal DT strategy documents (128 pages).
DT strategy workshops	Attendance of a two-day DT strategy workshop involving several areas, e.g., manufacturing operations and IT (11 initiatives).
Interviews	Nine semi-structured interviews with shop floor management workers in diverse hierarchical roles (two interviewers; 40-minute average interview duration).
Focus groups	Six exploratory focus groups with production employees in diverse hierarchical roles (4-5 researchers per focus group; 1.5-hour average duration)
DT meeting attendance	Weekly or biweekly attendance of two DT projects (3-4 for researchers per meeting, one-hour average duration).

First, we collected various internal strategy documents related to different DT projects in the organization. Second, we (four researchers) attended a two-day, in-person strategy workshop with upper and middle management. During this workshop, several DT initiatives were presented, whereafter workshop participants held interactive brainstorming discussions to establish synergies between projects and how they may build one another's efforts. Third, over eight months, we attended weekly or bi-weekly meetings of two DT projects, predominantly virtually. We also obtained documentation from these projects.

Moreover, to investigate differing perceptions of DT, we also collected data from employees in different hierarchical roles, as it has been shown that individuals located at different levels of an organization's hierarchy might have different perceptions of abstract phenomena, such as changes in organizational culture and identity (Corley, 2004). Thus, such a hierarchical classification was suitable for our purposes as DT also changes a firm's organizational identity (Wessel et al., 2021).

Accordingly, our fourth data source was interviews with shop floor management employees (Weiss, 1995). Here, we conducted nine semi-structured interviews (two upper management, four middle management, and three assembly line workers). In these interviews, we asked interviewees about opportunities in DT, specifically related to activities on the shop floor. Due to a non-disclosure agreement (NDA) with the case partner, interviews were not recorded. However, two interviewers were

present in all interviews, with one interviewer dedicated to notetaking. The interviews lasted between 30min and 50min and were done virtually.

Fifth, we conducted six exploratory focus groups (Hevner et al., 2010) with a total of 43 participants to gain insights into differing frames of reference of DT. We conducted three focus groups with upper management (21 participants), two focus groups with middle management (12 participants), and one focus group with assembly line workers (10 participants). We conducted at least one focus group in person for each employee group, with the remaining focus groups done virtually. Each focus group had four researchers attending to take notes, and the participants were also invited to fill out feedback forms and provide them to the researchers. During the focus groups, we presented easy-to-understand formulations of the organizations' current DT goals (synthesized from the strategy documents we reviewed) to serve as prompts for discussion points for the participants. To ensure comparability, these formulations were kept consistent across all focus groups. We identified selected DT themes as prompts that are broad enough to derive non-technology-specific insights, are "uniquely digital," and are relevant to the company so that discussants could associate with these goals. For example, one discussion point was "data consistency and quality" – a DT-specific phenomenon, but not limited to a particular technology. We conducted structured discussions informed by the technological frame domains, thus aimed at deriving insights that

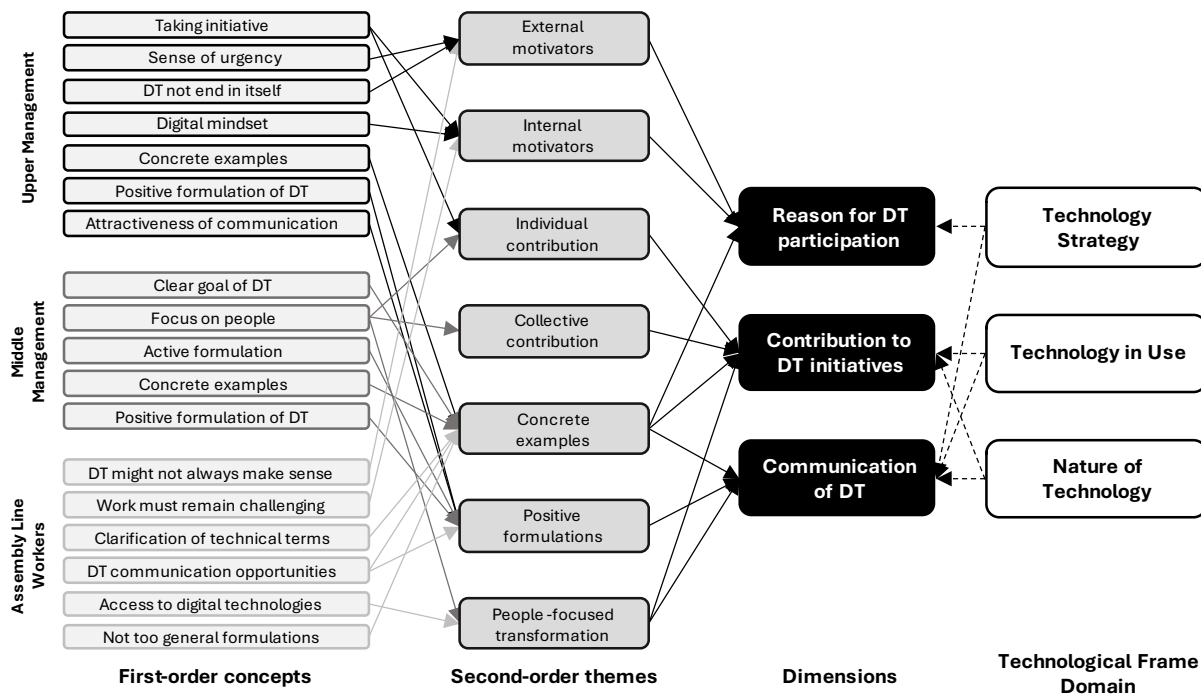


Figure 2. Overview of coding results and dimensions of DT perceptions

may assist in our goal of concretizing actors' perceptions of DT.

To analyze all the data sources and extract relevant insights, two authors first transferred all the contents to an online whiteboard collaboration tool. We then followed a structured coding approach and conducted two rounds of coding focused on the different organizational actors. The two rounds of coding were structured around our two lenses, namely technological frames and paradox theory.

Accordingly, before we intended to explore the potential tensions between the different organizational actors, we first examined how their actors' perceptions of DT are constructed based on the technological frames domains from Orlikowski and Gash (1994). Here, we followed an inductive approach as per Gioia et al. (2013), in which we used the adapted technological frame domains (Table 1) – i.e., the *what*, *why*, and *how* of DT perceptions – to guide the identification of first-order concepts (grouped by hierarchical level). Thereafter, we identified second-order themes and dimensions. In the second coding round, we took a deductive approach and conducted selective coding (Glaser, 1978). We based the selective coding on the four theoretical tension categorizations by Smith and Lewis (2011), which is suitable due to the abstraction level of this theoretical categorization (Figure 1). This allowed us to integrate our two theoretical bases by identifying instances of tension categorizations structured according to the different dimensions of the technological frames.

Figure 2 shows the coding structure and results of the first coding round, which resulted in the dimensions of actors' technological frames. The dashed arrows show how the technological frame domains from Orlikowski and Gash (1994) relate to each dimension. The results from our second round of coding are shown in Table 4.

4. Results

4.1. Dimensions of the DT perceptions

Our first round of coding revealed three dimensions constituting actors' DT perceptions based on technological frames. We discuss these dimensions below, along with elaborating on their relation to the technological frame domains from Orlikowski and Gash (1994).

The first dimension is the *reason for participation in DT*, corresponding to the *technology strategy* technological frame domain. In essence, this element deals with the “*why*” of DT. Actors across the hierarchical levels all addressed the fact that the reason *why* DT is undertaken, the motivation behind driving

DT initiatives, and its potential value for employees and the organization must be clear.

While we observed the reason DT participation dimension across all different hierarchical levels, it was interesting how actors' reasons differed. For example, upper management emphasized that DT initiatives must be undertaken based on a “sense of urgency” to ensure the organization keeps up with its competitors. From the assembly line workers' perspective, their reason for DT is rooted in the effect that it will have on their immediate work environment. They noted that DT should not be undertaken as an end, but the reasoning behind its implementation and the value it provides to employees must be precisely considered. For them, this value was considered their day-to-day work: they noted that DT should not merely be implemented for efficiency and to feed them instructions; instead, DT must improve their day-to-day work but keep it mentally stimulating.

The second dimension is the perceived *contribution to DT* initiatives and deals primarily with the “*how*” of DT implementation. This element corresponds to two technology frame domains: first, it corresponds to *technology in use*, in that actors' “image” and understanding of DT's potential affect their perception of how they can contribute to DT. Second, the *nature of technology* encapsulates actors' understanding of how technology will be used on a day-to-day basis, along with likely actual conditions and consequences of this use, thus also affecting their perception of how they may concretely contribute to DT efforts.

We also observed differing perceptions of how actors think they can contribute to DT. For upper management, a contribution to DT was perceived as taking self-initiative to drive DT initiatives and to get to the point “doing,” rather than “endless planning.” Middle management focused instead on DT's potential to create value through the “wisdom of the crowd”: that digital technologies can enable everyone in the organization to contribute and learn from one another. While they did not elaborate extensively on examples of such “value,” they associated the value creation process strongly with using tools such as Microsoft Teams which enables them to collaborate easily. Assembly line workers made an especially interesting comment on perceiving their contribution. Even though these workers work with digital technologies daily, receiving information necessary to operate the assembly line (e.g., screens with takt time), they did not perceive this touchpoint as contributing to digital efforts, as these tools merely *provide* information and there is not an *active* contribution.

The third dimension is the *communication of DT* initiatives and corresponds to all three of the

technological frame domains. Interestingly, we saw multiple common perspectives across all three hierarchy levels. All participants noted that the *reason* for participating in DT initiatives must be clear in the organization's communication (technology strategy). Here, participants specifically emphasized that the communication of DT strategies should focus on *people*, not just digital technologies. Moreover, participants emphasized that "what DT looks like on a daily basis" – for example, which technologies the organization intends to deploy (nature of technology) – must also be clear in the communication. Here, all employee groups emphasized the need for *concrete examples*, with assembly line workers also calling for clarification of technical terms. Lastly, all employee groups noted that communication should be clear in terms of what employees' potential contribution to DT is (technology in use). Again, there was a consistent call for concrete examples. It was also consistently mentioned that DT should not be formulated *subjunctively* (i.e., employees "should" do task "A" or "B"). Instead, the organization should communicate DT, its nature, and potential, *indicatively* or "*actively*": i.e., DT, its value, and how employees can contribute to it must be stated as a "fact."

4.2. Organizational tensions

Our second round of coding entailed identifying organizational tensions as per Smith and Lewis' (2011) framework. We highlight interesting tensions from different hierarchical groups for each tension category.

Learning tensions refer to the new knowledge that must be learned during the DT process, which may contrast with the extant "traditional" knowledge that actors possess. Upper management was less concerned about learning concrete hard skills and associated learning more with unlearning an "old-fashioned traditional mindset" and embracing a digital mindset. Middle management did not elaborate on concrete learning tensions, but perceived the learning potential in DT as a collective endeavor, believing that DT allows employees to pool their knowledge, thus enabling the organization to "learn as a whole." As noted in 4.1, assembly line workers experienced learning tensions through how DT affects the complexity of their work. They noted concerns that DT should not change the nature of their work and that they are merely "instructed"; rather, they wished for DT to advance mental stimulation in their daily tasks.

Belonging tensions entail the (mis)alignment of actors' identities with that of the firm. Upper management noted that DT requires employees to change their mindset to align with the firm's new

identity of a "digital firm." Assembly line workers noted that for them to be able to contribute to this new "digital firm," they require similar access to digital tools as administrative employees, even if they do not necessarily have the same daily touchpoints as, for example, mid-level management who work with cloud-based tools. They noted that if they are to contribute to a "digital firm," access to digital tools is the first step.

Performing tensions refers to actors' multiple and possible divergent goals in DT. Upper management's goal of DT for the firm was to remain competitive in the market: thus, there must be a "sense of urgency" to drive DT to maintain and improve the organization's performance compared to its competitors. Middle management did not address the sense of urgency directly but rather noted that the goal of DT should be clear and linked to specific outcomes. Assembly line workers also did not provide specific details but noted that the goals of DT should "make sense," iterating the notion that DT should not be undertaken as an end.

Lastly, *organizing tensions* are caused by actors' diverging demands for control and flexibility within organizational systems and processes. Upper management was mainly concerned with harmonizing DT efforts. They noted that in a large, distributed firm, special attention needs to be paid to avoiding heterogeneity in IT architecture so that it can, for example, support a consistent and harmonized data pipeline. Middle management experienced this heterogeneity on "ground level," having to deal with challenges such as disparate systems or manual data transfers between systems. Assembly line workers (implicitly) addressed the tradeoff between control and flexibility of DT, in that DT-enabled information should aid their work, but not to such an extent where they are merely instructed; rather, they are interested in maintaining flexibility in applying their skills.

5. Discussion

5.1. Integrating DT perception dimensions and organizational tensions

With an overview of DT perception dimensions and organizational tensions in the DT context, we now integrate these insights to address our research objective of *how individuals' perceptions of DT, constructed through technological frames, explain organizational tensions in the DT context*. In Table 4, we present an integrated framework of the actual tensions from our data analysis (first-order concepts and second-order themes) based on the theoretical integration of the *DT perception dimensions* with the *theoretical tension categorizations*. Due to space

Table 4. Integrated DT perception dimensions and paradoxical tension categorizations

Technological Frame Dimensions in the DT Context						
Theoretical Tension Categorizations	Reason for DT Participation			Contribution to DT initiatives		
	Upper Management	Middle management	Assembly line workers	Upper Management	Middle management	Assembly line workers
Learning	Learn to “think digital”	Wisdom of the crowd	Mentally challenging work	Apply digital mindset	Collective contribution	Understand technical terms
Belonging	DT not end in itself	Focus on people	Inclusion in DT efforts	Drive transition to “digital” firm	Collective intelligence	Access to technologies
Performing	Sense of urgency	Clear goal of DT	DT must “make sense”	Taking initiative	Wisdom of the crowd	Contribute knowledge work
Organizing	Harmonized efforts	Collective intelligence	Beyond mere “info feeding”	Platform strategy	Knowledge exchange	Access to technologies

constraints, we do not show the communication dimension in the integrated framework; however, we regard the other two dimensions as prerequisites of the communication dimension, as DT communication is the instantiation of why DT is important and what actors can do to contribute to it. For both the *reason* and *contribution* of DT perception dimensions, we show how integrating these dimensions with organizational tension categories can explain why such tensions occur.

First, we see that actors’ *reason* for participating in DT affects why different types of tensions manifest. For *learning* tensions, we see, for example, that assembly line workers’ desire to do more mentally stimulating work with digital technologies may (de)motivate them to participate in DT. For *belonging* tensions, upper management’s concern about shifting from a traditional to a “digital mindset” shows that employees’ desire to participate in DT, or lack thereof, may be due to them being unwilling or slow to adopt a new “digital mindset.” For *performing* tensions, both middle management and assembly line workers noted that the reason for DT should be clear: there must be clearly defined goals linked to specific outcomes, and DT should not be merely undertaken as an end in itself. For *organizing* tensions, upper management noted that the overarching reason for DT is the harmonization of processes and the IT landscape. If stakeholders throughout the organization feel that “their” processes or systems are in danger of being standardized or made redundant, this may affect their reason to participate in such initiatives. Middle management’s insights in this sense were less concrete; however, they noted that DT initiatives must be structured around the people, not the technology. Thus, if DT’s value proposition is not to first and foremost aid employees’ work, this may result in decreased motivation in DT participation.

Second, actors’ *perceptions* of their *contribution* to DT also explain why different types of tensions manifest. For *learning* tensions, assembly line workers’ desire to not merely be fed information by digital technologies, but rather do mentally stimulating tasks enabled by such technologies, highlight the importance of actively contributing to DT. Here, middle management perceived the learning potential of DT as a collective endeavor: for example, by using cloud-based collaboration tools, employees can pool their knowledge, thus enabling the organization to “learn as a whole.” For *belonging* tensions, assembly line workers’ insights were the most concrete. As noted in 4.2, they highlighted that for them to contribute to DT actively, they require similar access to digital tools as administrative employees. If they are to belong to this transformed “digital firm,” adequate access to digital tools is the first step. For *performing* tensions, upper management noted that for the company to achieve its goals through DT, employees must contribute to DT by taking the initiative to drive these efforts. Lastly, for *organizing* tensions, upper management’s perceived contribution was to advance the use of digital platforms (specifically powered by cloud-based architectures) to enable a connected organization, complementing their motivation of harmonizing DT efforts. Middle management supported this notion and noted specific classes of technologies, such as employing technologies like Microsoft OneNote and Teams to facilitate DT in the firm. They reiterated DT’s focus on people and noted that the DT initiatives could be structured so that people are connected to exchange knowledge and contribute collectively. Assembly line workers noted that for them to contribute to DT, the company’s technological setup must be in such a way that they also have access to digital technologies.

5.2 Multiplicity of tension categorizations and DT perceptions

We also observe that, in many cases, DT perception dimensions are related to different types of tensions. Put differently, the same DT challenge (explained by DT perception dimensions) manifests in different organizational tension forms. Moreover, we see this for each of the hierarchical groups.

For example, upper management's emphasis on a "digital mindset" encapsulates different tensions. In terms of *learning*, a "digital mindset" requires new knowledge to be acquired and old knowledge to be "unlearned." This learning can, for example, be advanced by equipping employees with the skills to work with the latest technologies. However, a digital mindset shift entails more than just learning concrete technologies – it also entails a "digital type of thinking" that aligns with the new "digital identity" of the organization. Thus, for organizations whose identities and ways of thinking have traditionally been molded based on manufacturing physical products, it is understandable that employees may experience a disassociation in their *belonging* with a new "digital company." Moreover, the "digital mindset" also relates to how DT initiatives are *organized*. For example, managers noted that implementing the "platform strategy" also required "digital thinking" – i.e., a notion of interconnectivity across the organization that digital technologies enable, as opposed to traditional siloed IT architecture accompanied by a "siloed way of thinking."

For middle management, we see this multiplicity in their emphasis on people and the "wisdom from the crowd." In a *learning* sense, they noted that DT allows employees to contribute and learn from one another collectively. Accordingly, collective contribution does not only entail learning but also how DT efforts are *organized*. Organizing DT efforts so that many different employees can contribute to DT can be considered a prerequisite or enabler of learning. Moreover, middle management emphasized that DT should place people at the center – not the other way around – thus also addressing *belonging*. By advocating for the "wisdom of the crowd," it is clear that they regard *people* as most integral to the organization's identity, not the technology.

Lastly, assembly line workers also showed this multiplicity, especially pertaining to *organizing* and *belonging*. Their emphasis on having access to digital technologies may seem, at first, predominantly like an organizational matter. However, as DT changes its organizational identity, it is also understandable that access to digital technologies is the first step to identifying with the new "digital firm."

6. Conclusion

In this study, we aimed to explore the *root cause* of organizational tensions and proposed that exploring *individual employees'* technological frames – adapted for the DT context – can aid in explaining these tensions. We posited that should individuals have conflicting perceptions of DT, this can explain resistance to DT and failure in technology integration.

We conducted a single case study with participants from various hierarchical levels, integrated two streams of organizational management literature – technological frames paradox theory – and applied this integrated theoretical approach to our data to derive a more concrete understanding of how DT perceptions explain organizational tensions.

Our study makes several contributions to literature. First, to our knowledge, *paradox theory has not yet been integrated with technological frames*. We show the value of this theoretical integration, as our study shows that classifying the dimensions of actors' DT perceptions through paradox theory can provide a more nuanced understanding of how DT perceptions manifest in organizations. Second, our focus on *individual-level tensions* expands the existing literature, which has primarily examined such tensions at the organizational level. This perspective sheds light on the unique challenges and perspectives of individual actors involved in DT processes. Third, our study provides *theoretical categorizations of paradoxical tensions in the DT context*, moving beyond surface-level phenomena and offering a deeper understanding of the underlying dynamics, a notion that extant literature in this domain does not place its focus on. Our findings reveal that actors' perceptions of DT consist of three dimensions based on technological frames: the reason for DT, contribution to DT, and communication of DT. Moreover, we showed how these dimensions intersect with different organizational tension types. By doing so, we broke down DT as an abstract phenomenon into manageable components and showed why understanding the perceptions of those responsible for implementing DT – the individuals – can explain the origin of organizational tensions.

For practitioners, our study's implications are twofold. First, by utilizing the breakdown of actors' DT perceptions through paradox theory, practitioners can concretize the abstract nature of DT and provide tangible guidance for employees. Second, our findings highlight the importance of addressing tensions from the outset of DT initiatives, allowing for a people-centric approach that mitigates conflicts as they arise later in the DT process. Furthermore, based on our insights, we propose that practitioners consider

introducing digital technologies through a layered perspective (e.g., Baptista et al., 2020), which may offer a “soft” introduction to DT and act as a basis to mitigate the abstractness of DT. We intend to explore this layered perspective in future research.

Lastly, while our study offers valuable insights, it has limitations. The single case study approach may limit the generalizability of our findings, and future research could benefit from exploring other contexts (e.g., firm sizes) and industries. Additionally, the study focused on a specific set of technological frames and tension categorizations, and further research could expand on these dimensions or explore additional theoretical perspectives. We especially propose that exploring the *drivers* of paradoxical tensions (change, scarcity, and plurality) may yield interesting theoretical insights, as these drivers are precursors to the theoretical tension categorizations we investigated.

In conclusion, our study offers novel insights into how exploring individuals’ perceptions of DT may explain why challenges in a DT journey may arise.

References

- Baptista, J., Stein, M.-K., Klein, S., Watson-Manheim, M. B., & Lee, J. (2020). Digital work and organisational transformation: emergent digital/human work configurations in modern organisations. *Journal of Strategic Information Systems*, 29(2), 101618.
- Carlsson, L. (2023). Strategizing organizational capabilities for industrial digitalization—exploring managers’ technological frames. *Journal of Manufacturing Technology Management*, 34(9), 20-39.
- Corley, K. G. (2004). Defined by our strategy or our culture? Hierarchical differences in perceptions of organizational identity and change. *Human Relations*, 57(9), 1145-1177.
- Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: opportunities and challenges. *Academy of Management Journal*, 50(1), 25-32.
- Gierlich-Joas, M., & Zimmer, M. P. (2023). Digital workplace transformation triggers a shift in the HR function: From resource manager to growth catalyst *ICIS, Kristiansand*.
- Gioia, D. A., Corley, K. G., & Hamilton, A. L. (2013). Seeking qualitative rigor in inductive research: Notes on the Gioia methodology. *Organizational Research Methods*, 16(1), 15-31.
- Glaser, B. G. (1978). *Theoretical sensitivity: advances in the methodology of grounded theory*. Mill Valley, California: The Sociology Press.
- Gregory, R. W., Keil, M., Muntermann, J., & Mähring, M. (2015). Paradoxes and the nature of ambidexterity in IT transformation programs. *Information Systems Research*, 26(1), 57-80.
- Hevner, A., Chatterjee, S., Hevner, A., & Chatterjee, S. (2010). Design science research in information systems. *Design research in information systems: theory and practice*, 9-22.
- Lewis, M. (2000). Exploring paradox: Toward a more comprehensive guide. *Academy of Management Review*, 25(4), 760-776.
- Nolte, F., Guhr, N., & Richter, A. (2020). The journey towards digital work empowerment—conceptualizing is-induced change on the shop floor. *ICIS, India*.
- Orlikowski, W. J., & Gash, D. C. (1994). Technological frames: making sense of information technology in organizations. *ACM Transactions on Information Systems (TOIS)*, 12(2), 174-207.
- Riasanow, T., Setzke, D. S., Böhm, M., & Krcmar, H. (2019). Clarifying the Notion of Digital Transformation: A Transdisciplinary Review of Literature. *Journal of Competences, Strategy & Management*, 10(April), 5-31.
- Smith, W. K., & Lewis, M. W. (2011). Toward a theory of paradox: A dynamic equilibrium model of organizing. *Academy of Management Review*, 36(2), 381-403.
- Soh, C., Yeow, A., Goh, Q., & Hansen, R. (2019). Digital transformation: of paradoxical tensions and managerial responses, *ICIS, Munich*.
- Spieth, P., Röth, T., Clauss, T., & Klos, C. (2021). Technological frames in the digital age: Theory, measurement instrument, and future research areas. *Journal of Management Studies*, 58(7), 1962-1993.
- Svahn, F., Mathiasen, L., & Lindgren, R. (2017). Embracing digital innovation in incumbent firms: how Volvo Cars managed competing concerns. *MIS Quarterly*, 41(1), 239-254.
- Toutaoui, J., Benlian, A., & Hess, T. (2022). Managing paradoxes in bi-modal information technology functions: A multi-case study. *Information Systems Journal*, 32(6), 1-26.
- Viljoen, A., Hein, A., Przybilla, L., Soto Setzke, D., & Krcmar, H. (2022). Striving for global optima in digital transformation: a paradox theory approach. *ICIS, Copenhagen*.
- Walsham, G. (1995). Interpretive case studies in IS research: nature and method. *European Journal of Information Systems*, 4(2), 74-81.
- Weiss, R. S. (1995). *Learning from strangers: The art and method of qualitative interview studies*. Simon and Schuster.
- Wessel, L., Baiyere, A., Ologeanu-Taddei, R., Cha, J., & Blegind-Jensen, T. (2021). Unpacking the difference between digital transformation and IT-enabled organizational transformation. *Journal of the Association for Information Systems*, 22(1), 102-129.
- Wimelius, H., Mathiasen, L., Holmström, J., & Keil, M. (2021). A paradoxical perspective on technology renewal in digital transformation. *Information Systems Journal*, 31(1), 198-225.
- Yin, R. K. (2018). *Case study research and applications*. Sage.
- Yoo, Y., Henfridsson, O., & Lyytinen, K. (2010). The new organizing logic of digital innovation: an agenda for information systems research. *Information Systems Research*, 21(4), 724-735.