RESEARCH PAPER

Identifying Digital Transformation Paradoxes

A Design Perspective

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Abstract In turbulent contexts, organizations face contradictory challenges which give rise to management tensions and paradoxes. Digital transformation is one such context where the disruptive potential of digital technologies demands radical responses from existing organizations. While prior research has recognized the importance of coping with organizational paradoxes, little is known about how to identify them. Although it may be apparent in some settings which paradoxes are at play, other more ambivalent contexts require explicit identification. This study takes a design perspective to identify the relevant paradoxes in a digital transformation context. It presents the results of a 2-year action design research study in collaboration with an organization that chose to explicitly focus on paradoxical tensions for managing its digital transformation. The study's main contribution is twofold: (1) it presents design knowledge to identify organizational paradoxes; (2) it provides a better understanding of the organizational paradoxes involved in digital transformation. The design knowledge will help others to identify paradoxes when working with an organization and highlights dynamic and collaborative aspects of the identification process. The study also enhances the descriptive understanding of digital transformation paradoxes by showing the importance of learning and belonging tensions and by expressing a different view on what knowledge about paradoxes is, and how it is created and used.

1 Introduction

In turbulent environments, organizations face paradoxical tensions (Quinn and Cameron 1988; Smith and Lewis 2011; Schad et al. 2016). Paradoxes represent competing demands that have to be met, even though they are at odds with each other. One context which is naturally linked to such competing demands is digital transformation. It requires organizations to balance exploration and exploitation (Benitez et al. 2018) and to focus on speed, experimentation and stability at the same time (Haffke et al. 2017). A nascent body of literature studies organizational paradoxes and the accompanied managerial responses in digital transformation (Svahn et al. 2017; Tumbas et al. 2018), promoting a both/and approach to decision-making (Gregory et al. 2015; Soh et al. 2019; Wimelius et al. 2021).

The paradox literature has established the importance of identifying and dealing with organizational paradoxes in turbulent environments (Smith and Lewis 2011; Schad et al. 2016). Still, it mostly focuses on how to deal with paradoxes rather than how to identify them. While it may be apparent in some settings which paradoxes are at play, other more ambivalent contexts require explicit

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identification. This is where our study contributes by using a design perspective. Our research aims to answer two questions: (1) Which organizational paradoxes are involved in digital transformation, and (2) how can organizations identify those organizational paradoxes that matter for decision-making?

To answer these questions, we use action design research (ADR) (Sein et al. 2011), a specific genre of design research (Peffers et al. 2018). The purpose of ADR is to design an artefact to solve a problem, considering the specific organizational context (Tumbas et al. 2018; Soh et al. 2019; Wimelius et al. 2021). At the same time, ADR aims to derive general design principles. With the research for this article, we started from the problem of Arcadis,[1] a global consulting firm in the construction industry. To solve the problem of Arcadis – i.e., How to identify organizational paradoxes and consider them in digital transformation decision-making? – we derived a set of design principles, following the recommendations of Gregor et al. (2020). These principles allow for the initial identification of organizational paradoxes and bring these to bear in decision-making.

Our study's contribution is twofold: (1) it presents design knowledge to identify organizational paradoxes and consider them in decision-making, (2) it provides a better understanding of the organizational paradoxes involved in digital transformation. First, with this study we add new practical design knowledge about the phrasing and selection of organizational paradoxes and about how to consider paradoxes in decision-making. Our research demonstrates that using paradoxes for decision-making makes the formulation process dynamic and that collectively identifying paradoxes leads to both/and-thinking in the organization. Second, we improve the understanding of digital transformation. We highlight the importance of ADR and other interventionist approaches for studying digital transformation. We promote digital transformation paradoxes from being a theoretical concept to one that also can – and should – be used for decision-making in practice. We show that the paradoxes that are used for decision-making do not remain stable over time, but evolve. We improve the understanding of digital transformation paradoxes by calling attention to the central position of learning and belonging paradoxes.

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2 Background

2.1 Organizational Paradoxes

An organizational paradox is a "persistent contradiction between interdependent elements" (Schad et al. 2016). It consists of "contradictory yet interrelated elements (dualities) that exist simultaneously and persist over time; such elements seem logical when considered in isolation, but irrational, inconsistent and absurd when juxtaposed" (Smith and Lewis 2011). In contrast to a dilemma, which shows when an either/or decision has to be made, a paradox is a type of tension that promotes a both/and approach (Smith et al. 2016). Paradox research has identified several categories of such both/and tensions (Schad et al. 2016). Although some studies focus on just one or a couple of categories (e.g., Andriopoulos and Lewis 2009; Farjoun 2010; Wareham et al. 2014), others have provided a typology. A first typology of paradoxical tensions by Lewis (2000) was further complemented by Lüscher and Lewis (2008) and eventually led to Smith and Lewis' (2011) classification into 4 types of paradoxes: (1) learning: tensions between building upon and destroying the past to create the future (O'Reilly and Tushman 2008), (2) organizing: tensions between competing organizational designs and processes (Gittell 2000), (3) performing: conflicting demands of various internal and external stakeholders (Donaldson and Preston 1995), and (4) belonging: identity tensions between the individual and the collective (Kreiner et al. 2006).

An important theme in organizational paradox research is how and when latent, complementary tensions become manifest as salient, contradictory tensions. Paradoxes can be embedded in organizing processes as latent tensions which do not hinder the functioning of the organization (Smith and Lewis 2011). However, these tensions can become salient, or are experienced by organizational actors as contradictory, after a trigger (Smith and Lewis 2011). Schad et al. (2016), in their structured content analysis of 25 years of paradox research, provide an overview of such triggers. They include environmental conditions – i.e., plurality (Adler et al. 1999), change (Huy 2002), or scarcity (Smith 2014) – and actors' individual cognitive frames encouraging oppositional thinking (Smith and Lewis 2011).

Paradox literature states the importance of identifying and dealing with paradoxical tensions, but most research focuses on how to deal with paradoxes rather than how to identify them. Paradoxes cannot be resolved (Poole and Van de Ven 1989), but coping mechanisms include acceptance and working through the paradox, spatial or temporal separation, synthesis, or any combination of these approaches (Schad et al. 2016; Jarzabkowski et al. 2013).

One exception to the shortage of research on paradox identification is the work of Lüscher and Lewis (2008). They provide some advice on how to identify paradoxes in an action research study at Lego. In the study, researchers and middle managers engaged in sparring sessions using the notion of paradox as a lens to make sense of organizational change (Lüscher and Lewis 2008).

2.2 Paradoxes in Digital Transformation

One example of a turbulent environment, in which organizations are known to face paradoxical tensions (Quinn and Cameron 1988; Smith and Lewis 2011; Schad et al. 2016), is the digital transformation context. Digital transformation is defined as "a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies" (Vial 2019). It is a strategic response to the threat of new entrants bidding on the disruptive potential of digital technologies, which require the adoption of new technologies as well as significant complementary organizational changes (Bharadwaj et al. 2013; Carlo et al. 2012; Matt et al. 2015; Selander and Jarvenpaa 2016; Svahn et al. 2017). As a result, digital transformation asks a lot of organizations: to simultaneously explore and exploit business opportunities (Benitez

Table 1 Digital transformation paradoxes

Reference	Focus	Approach	Paradoxes	Responses
Gregory et al. (2015)	Managerial challenges involved in executing IT transformation programs	Grounded theory application for the case of a large international bank implementing a strategic IT transformation program	IT efficiency and IT innovation (portfolio)	Blending Balancing
			IT standardization and IT differentiation (platform)	
			IT integration and IT replacement (architecture)	
			IT program agility and IT project stability (planning)	
			IT program control and IT program autonomy (governance)	
			IT program coordination and IT program isolation (delivery)	
Svahn et al. (2017)	Competing concerns incumbent firms face as they embrace digital innovation	Longitudinal case study of Volvo's connected cars initiative	Innovation capability: existing and requisite	NA
			Innovation focus: product and process	
			Innovation collaboration: internal and external	
			Innovation governance: control and flexibility	
Tumbas et al. (2018)	Approaches CDOs take for navigating the organizational tensions with other existing departments and functions	Grounded theory application, interviews with 35 CDOs	NA	Grafting Bridging Decoupling
Soh et al. (2019)	Competing demands of digital transformation through a paradox lens	Longitudinal case study of a global sportswear company on a journey from B2B to also (online) B2C	Belonging: B2B company and omni-channel company	Defensive Receptive
			Performing: not alienating B2B and attracting B2C customers	
			organizing: existing B2B and new B2C systems/processes, existing B2B workload and increased workload supporting B2C	
			Learning: employees' B2B and B2C competencies	
Wimelius et al. (2021)	Technology renewal as a paradoxical digital transformation process	Longitudinal case study of a failing renewal initiative at a large, distributed Swedish health care provider	Established and renewed technology usage	Integrating Splitting Pretending Avoiding
			Deliberate and emergent renewal practices	
			Inner and outer renewal contexts	

et al. 2018), to stay in tune with environmental turbulence in the form of new technological possibilities, of digital natives entering the industry, and of ever-changing customer expectations (Viaene and Danneels, 2015; Viaene 2020).

A nascent body of research uses a paradox lens to study digital transformation, see Table 1. To obtain an overview of this body of research, we performed a keyword search in the main information systems journals (BISE, EJIS, ISJ, ISR, JAIS, JIT, JMIS, JSIS, MISQ) and conferences (AMCIS, ECIS, ICIS, PACIS) on the combination of digital transformation (and related terms such as transformation programs or digital innovation) and paradox (and related terms such as tensions, paradoxical tensions, or competing concerns). Our initial search, which focused on only digital transformation and paradox, delivered one result. After a backward and forward search, we broadened our search range by also including related terms, which resulted in a set of five articles about paradoxes in digital transformation.

The studies we have identified in Table 1 deal with different aspects of digital transformation – ranging from IT transformation challenges and technology renewal to the role of the CDO – and use qualitative research approaches – i.e., grounded theory and longitudinal case study research – for doing so. Their main assertion is that dealing well with organizational paradoxes is very important in digital transformation: "receptive responses enable and sustain digital transformation by addressing both poles of the paradox while defensive responses may enable digital transformation to proceed, their emphasis on one pole over the other contributes to stalling the digital transformation in the long term" (Soh et al. 2019). Similar to research on organizational paradoxes in general, these studies predominantly focus on how to respond to organizational paradoxes rather than how to identify those tensions that are important for decision-making. Therefore, we use a design perspective to derive a set of design principles which allow for the initial identification of those organizational paradoxes that matter for decision-making.

3 Methodology

The aim of design science research (DSR) (Hevner et al. 2004; Peffers et al. 2018) is to design a new and innovative artefact and to acquire knowledge on how it should be designed. We use an action design research (ADR) approach, a specific genre of DSR (Sein et al. 2011). A key aspect of ADR – distinguishing it from other DSR genres – is that it stresses the importance of building and evaluating ensemble artefacts in their organizational setting (Sein et al. 2011). It is characterized by organizational impact

and learning as well as by continuous feedback (Henfridsson 2011; Danneels and Viaene 2015). This makes ADR especially fit for studying digital transformation, where organizational context plays an important role (Soh et al. 2019). In contrast to action research, ADR complements the focus on the organizational context with the creation of an artefact and explicitly aims for artefact generalizability (Henfridsson 2011).

3.1 ADR Research Context

Arcadis is a global design and consultancy firm in the construction industry, with Dutch roots dating back to 1888. At the time of the research, it employed some 27.000 employees that generated €3.5 billion in revenues.

Arcadis has grown through multiple acquisitions, resulting in an organization with global reach: it spans five continents and has hundreds of offices delivering projects in more than 70 countries. It has also developed into an organization fragmented into regions that each have different business lines, expertise areas (buildings, infrastructure, environment, water), and services (design & engineering, program management, consultancy, project & cost management, architectural design).

In 2017, Arcadis lost the bid for an urban development project at Waterfront Toronto, not to one of its competitors in the construction industry, but to Sidewalk Labs, a subsidiary of Alphabet and a sister company of Google. In addition to this external trigger, Arcadis also had internal drivers propelling its digital transformation. Later in 2017, Arcadis' CEO claimed that Arcadis wanted to become a digital frontrunner (Arcadis 2017). The company launched a digital transformation program (Danneels & Viaene 2021), which evolved during the time period of this study. An overview of the critical digital transformation interventions is presented in Fig. 1. Collectively, these interventions set the transformation in motion which eventually turned a company delivering 'billable hours' project-based consultancy work into a company with its own portfolio of digital products and services including, e.g., an analytics tool that helps cities to better steer urban expansion and housing. At the same time, Arcadis' value proposition is changing from managing large construction projects to improving quality of life by managing the entire life cycle of built assets. The percentage of net revenue from 100% Building Information Management projects – using a digital representation of a built asset for information sharing between all parties which contribute to a construction project – has risen globally from 25% in 2018 to 65% in 2020. Since 2019, Arcadis hosts a startup accelerator (Arcadis City of 2030 Accelerator) for young tech businesses in the construction space. In 2020, a separate organizational unit, Arcadis Gen, was launched which
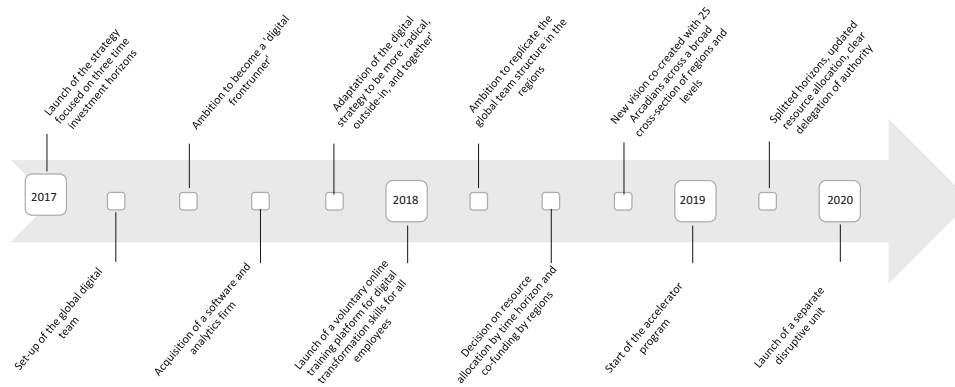
Fig. 1 Timeline of the critical digital transformation interventions at Arcadis

would focus on developing disruptive digital solutions such as enterprise asset management and enterprise decision analytics.

Arcadis is characterized by a company culture that considers its people as its most important asset. This is illustrated by the 'people first' company value and the 'people & culture' strategic pillar. The company aims to create a "respectful working environment where our people can grow, perform and succeed […] with the goal to attract, develop, and retain the workforce of the future" (Arcadis 2019). In line with this people-centric company culture, Arcadis decided not to create too many new functions for digital transformation, but instead provide people with new skill sets in their current function.

Arcadis' transformative ambitions aim to leverage the power of the group at a global level. This is illustrated by a statement in the slide deck seeding the discussion in one of the co-creative workshops for designing the digital transformation vision during 2018:

> We should be an integrated business, one Arcadis from a service provision and vision standpoint. One global firm. [This includes] sharing best practices and a stronger global operating model, break[ing] down silos, [and the] consolidation to one vision and identity. (Arcadis 2030 Vision workshop, Amsterdam, April 25th, 2018)

However, as an executive explained at the end of 2018, the fragmentation of the company turned out to be a major hurdle for driving the digital transformation program forward:

> It is the most difficult because we are very fragmented and diverse, and always have been, and fragmentation is our biggest enemy, but at the same time the reason why we exist. We need to understand that we can only be successful if we develop a 'one Arcadis transformation program', but on the other

hand 70–80% of our business is very locally and client-driven, so 'how do you connect those two?' is probably the biggest challenge we have. (#6)

It was from this point, with digital transformation causing tensions in a fragmented organization, that we started our ADR research.

3.2 Insights into the Design Research Process

Our DSR strategy was to start from Arcadis' specific problem by designing a concrete management artefact and to learn from that intervention in order to design a general solution concept to address a broader class of problems (Iivari 2015). Our approach covered all four stages of an ADR process (Sein et al. 2011) as depicted in Fig. 2, and was accomplished in close collaboration with Arcadis.

The ADR trajectory was carried out as an iterative process through a series of workshops in which the authors acted as workshop facilitators. In doing so, we followed Lüscher and Lewis' (2008) suggestion to use an external facilitator for identifying paradoxes. In Table 2 we provide an overview of all ADR interventions: 4 workshops, interviews with 15 selected key employees, and an evaluation of the artefact.

At the beginning of the research in 2017, the ADR core team consisted of both authors, Arcadis' chief digital officer (CDO), and the global digital team members (4 global digital directors). Over time, the ADR core team expanded as the composition of the digital team changed and as insights from the design process required changes in the ADR team. As of 2019, the ADR core team consisted of 15 people: both authors, the CDO, the global digital team members, and several people responsible for digital transformation of regions and business lines, a person responsible for people & change management, a person responsible for corporate strategy, the group board member

Table 2 ADR interventions

Intervention and objective	Events leading up to the intervention (incl. preparation)	Course of the intervention	Outcome
First ADR workshop (September 2018): Set-up of the ADR trajectory and discussion on the role of the global digital team	The researchers summarized 4 key objectives for the global digital team based on an exploratory review of the literature on digital transformation and organization design Preparatory reading for the participants: Svahn et al. (2017)	4-h face-to-face workshop with 2 authors, CDO and 4 global digital team members: The researchers presented the 4 key objectives they identified for the global digital team, which would be used to guide the discussion on the role of the global digital team The practitioners discussed the role of the global digital team by individually writing down the concrete practices they designed for achieving each of the 4 key objectives, which we then discussed in group We discussed which practices the global digital team would continue, improve, stop and introduce. We focused on alignment across all global digital team members At the end of the workshop, the practitioners formally evaluated the 4 key objectives	Agreement around 4 key objectives for the global team as a digital transformation support organization Need to objectify and validate the role and position of the central digital team towards the regions Tensions and a lot of "A or B" discussions
Second ADR workshop (October 2018): Introduction of the focus on paradoxes	Workshop one created a clear view on the problem instance, but there was no clear view yet on the artefact to be developed The discussions in workshop one fueled the researchers to focus on paradoxes	2-h online workshop with 2 authors, CDO and 4 global digital team members: The researchers introduced the focus on paradoxes with a short summary of the paradox literature The practitioners performed a first exercise to get acknowledged with paradoxical thinking: they listed tensions linked to each of the digital transformation keywords at Arcadis (survive, reinvent, 3 horizons, radical, outside-in, together) and for the 4 key objectives of the global digital team formulated in the first workshop	Awareness that each silo (global digital team, regions, global excellence centers (GECs)) claimed responsibility for certain aspects of the digital transformation, without agreeing on who would bear financial responsibility Broadening of the digital team from involving only people from headquarters to also including people from the regions and the GECs Decision that all members of the extended digital team had to be included in further identification of the paradoxes
Interviews (October 2018–January 2019): Identify digital transformation paradoxes that matter for decision-making at Arcadis	During the second ADR workshop, it was decided that all members of the digital team would have an individual follow-up call to focus further on the paradoxes Key employees were selected by the ADR team to include perspectives from the digital team and the business, and from different regions, see Table 3	Online 1-h interviews by one author with 15 selected key employees, see Table 3 for interview details: During the interviews, the study's objectives were explained and we focused on identifying the most important paradoxes linked to driving digital transformation at Arcadis The researchers asked the interviewees to list paradoxes for each of the digital transformation keywords at Arcadis (survive, reinvent, 3 horizons, radical, outside-in, together) and for the 4 key objectives of the global digital team formulated in the first workshop	Better view on the individual perspectives on paradoxes
Third ADR workshop (January 2019): Discuss the long list of paradoxes identified by the researchers	Interview data was analyzed by the researchers and summarized into first-order themes close to the interview data, see Table 4	2-h face-to-face workshop as part of a full day digital team meeting with one author, the group executive innovation and transformation, CDO, 3 global digital team members and 7 regional digital team members: The researchers presented the long list of paradoxes identified in the interviews and discussed the long list and the first-order themes with the practitioners For two of the first-order themes, the practitioners discussed in groups the strategic choices and concrete decisions they would make (e.g., "In order to continue on our transformation journey, there needs to be an acceptance that digital transformation is a continuous process and we are all at different starting points." And "In order to have an effective transformation, we need to have one voice and work as one connected team, and we need to tailor our internal communications to regional audiences to engage them.")	Recognition of the identified paradoxes Realization that a focus on key paradoxes is necessary and that the paradoxes need to be further adapted (in terms of phrasing and which of the two poles to put first) Discussion about the need for clear roles and responsibilities

Table 2 continued

Intervention and objective	Events leading up to the intervention (incl. preparation)	Course of the intervention	Outcome
Fourth ADR workshop (June 2019): Present and discuss 4 key digital transformation paradoxes at Arcadis	The long list of paradoxes was reduced to 4 key paradoxes by the researchers, using input from the third ADR workshop The paradoxes were further contextualized by the researchers	2-h face-to-face workshop by one author as part of a full day digital team meeting with the CDO, 2 global digital team members, 1 regional digital team member: The ADR team discussed the strategic choices to be made over time for each pole, how these choices were made, and which practices they used The ADR team mapped the progress made over time for each pole The team discussed how it would cope with the tensions in the future	Change in the order of the paradoxes, and change in phrasing of one paradox A sense of appreciation within the team that, even though the paradoxes would not disappear, Arcadis was indeed making progress on each of the poles Ongoing discussion on how paradoxes are reflected in the digital strategy
Evaluation (August–September 2019): Evaluation of the paradoxes	The researchers wanted to evaluate the agreement with the paradoxes as part of the BIE stage Not all extended digital team members were present in the fourth workshop	Individual evaluation of the validity of the paradoxes via e-mail, see Table 6	High buy-in of all governance paradoxes (mean score of at least 3.5 on a 5-point Likert scale, and 3 out of 4 paradoxes scored 4.3 or higher) Discussion around one paradox remains

responsible for innovation and transformation, and several country CEOs.

3.2.1 Problem Formulation

Our research was driven by a specific problem encountered in the intervention domain (Sein et al. 2011; Mullarkey and Hevner 2019). Clarifying this problem was part of the ADR trajectory, and the paradox concept was only introduced after the first ADR workshop, see Table 2. In the beginning of the ADR trajectory, the idea was that the researchers would help to set up the governance approach supporting the digital transformation at Arcadis. However, while doing so, the attention shifted towards some core stakeholder conflicts which took the form of "A or B" discussions. In the second ADR workshop, the researchers suggested focusing on identifying "A and B" paradoxes and considering these in digital transformation decision-making. At this stage, the researchers also reviewed the literature on digital transformation and paradoxes, as a way to structure the problem, identify solution possibilities and guide the design of the artefact (Sein et al. 2011).

3.2.2 Building, Intervention, and Evaluation (BIE)

The purpose of the BIE stage was to actively identify the key digital transformation paradoxes at Arcadis. The BIE stage was carried out as an iterative process. The paradoxes were identified and refined over time by the ADR team in the workshops. For identifying the paradoxes, the researchers used Smith and Lewis' (2011) definition of a paradox which "consistently embed[s] multiple, often inconsistent perspectives" and "reflect[s] contradictory yet interrelated elements, which exist simultaneously and persist over time".

After the first exploratory identification of paradoxes in the workshop, the researchers adopted a more structured approach to identify the digital transformation paradoxes at Arcadis. 15 semi-structured, open-ended interviews were held with selected key employees to include perspectives from the digital team, the business lines, and from different regions, see Table 3. During the interviews, one researcher asked the interviewees to list the most important paradoxes that appeared when driving digital transformation at Arcadis. To make sure that the interviewees took into account different aspects of the digital transformation, we made them list paradoxes for each of the digital transformation keywords used internally for describing Arcadis' digital transformation and for each of the different roles of the digital team specified in the first ADR workshop, see Table 2. Interviews lasted about one hour. Notes were taken during the interviews, and interviews were recorded and transcribed. One author summarized the interview transcripts into first-order themes close to the interview data. The other author acted as a sounding board. The interview data were extensively triangulated with company data throughout the whole process.

The interviews resulted in a long list of over 100 common first-order themes identified by the researchers, see Table 4. At this stage, not all themes represented paradoxes as defined by Smith and Lewis (2011), but contrasting the themes from different interviews eventually contributed to a first identification of the paradoxes. Important themes included, amongst others, the relationship between the global parts of the company and the regions, and balancing internal and external communication of the digital

Table 3 Interview details

Interviewee number	Interviewee function	Date	Recording duration	Transcript length: words
#1	Chief digital officer	26/10/2018	47:58:00	4811
#2	Global director digital platform and ecosystem partnerships	24/10/2018	48:47:00	7801
#3	Global director digital innovation	26/10/2018	57:34:00	7302
#4	Global director data, analytics and insights	13/11/2018	47:13:00	5080
#5	Global director digital asset life cycle	22/10/2018	59:30:00	6648
#6	Group executive innovation and transformation	22/11/2018	no recording	NA
#7	Executive director Asia Pacific – clients, innovation and strategy & regional solutions leader Asia	22/11/2018	1u25	3570
#8	Managing director GEC India	11/12/2018	44:08:00	6920
#9	CEO Arcadis Netherlands	11/12/2018	49:35:00	3939
#10	Chief digital officer North America	11/12/2018	52:10:00	5835
#11	Global solutions director and leader for program management	14/12/2018	44:31:00	5480
#12	CEO Czech Republic, Germany, Poland, Slovakia & Switzerland	14/12/2018	47:56:00	4293
#13	Group executive Europe, UK and the Middle East	04/01/02019	46:28:00	5520
#14	CEO/COO Arcadis North America	04/01/2019	28:35:00	1941
#15	Chief strategy and transformation officer, Europe, Middle East and UK and CEO Europe South	18/01/2019	29:33:00	3723

Table 4 Interview coding categories

First-order themes	Second-order coding based on Smith and Lewis (2011)	Key paradoxes
Funding and communication	Belonging paradox	Build new capabilities and perform in the current business
Prioritizing	Organizing paradox	Take everyone along and aim for radical change
Us and them	Performing paradox	Global strategy and regional entrepreneurialism
No clear path to the future	Learning paradox	Clear communication and continuous learning
Duplications		
Lack of communication		
What does it mean to me and my job?		
Lack of understanding between silos		
Etc. (over 100 themes identified)		

program. The interview data was further analyzed in a dialogical process between data and theory (Walsham 1995; 2006; Klein and Myers 1999), using the paradox categories defined by Smith and Lewis (2011) for coding the first-order themes according to second-order codes. This led to the identification of four key paradoxes at Arcadis.

We evaluated the agreement with the paradoxes as part of the BIE stage, especially since not all extended digital team members were present in the fourth workshop. In follow-up emails sent between August and September 2019, the researchers asked all ADR team members to score the validity of the key paradoxes on a 5-point scale (fully agree, partly agree, neutral, partly disagree, fully disagree). All ADR team members were involved in identifying those paradoxes that matter for decision-making – and continued to be involved in their further development – , but for this task, we merely received a response from 10 out of 15 members.

3.2.3 Reflection, Learning and Formalization

Parallel to the first two stages, we moved conceptually from building a solution for a particular instance (i.e., identifying paradoxes for decision-making in the digital transformation context) to applying what we had learned to a broader class of problems (i.e., identifying those organizational paradoxes that matter for decision-making) and formulating general design principles. Six design principles form the crux of our theory and reflect our findings from a 2-year ADR study. The design principles co-evolved with the digital transformation paradoxes, see Fig. 3. The principles originated from an iterative, collaborative, and pragmatic ADR process. They are iteratively derived from the researchers' learning process that resulted from taking particular actions in and between the workshops. Design principles that reflected learnings from a particular intervention were challenged as a hypothesis at the start of the next collaboration cycle. The design principles were developed in a collaborative way, as they originated from mutual learning among the ADR team members. Some of the principles stem from practitioners' explicit appreciation of an intervention by the researchers, others originate from the reasearchers' observations of what worked and what did not work during the interventions. The principles are rooted in pragmatism (Goldkuhl, 2004, 2012; Marshall et al. 2005). We especially aimed to derive knowledge that is useful for action. The researchers summarized this acquired knowledge in formal design principles for the initial identification of those organizational paradoxes that matter for decision-making, following Gregor et al.'s (2020) schema for specifying design principles.

4 ADR Results

In this section, we share the new organizational knowledge that resulted from working on Arcadis' contextualized problem and from developing a contextualized solution. We present this solution, the key digital transformation paradoxes at Arcadis, along with general design principles for identifying organizational paradoxes.

4.1 Problem Formulation

At the start of our study, in 2017, the ADR team focused on the role of the global digital team, as Arcadis was struggling with setting up a globally driven digital transformation program in a fragmented organization. While some team members were in favor of the global team driving the digital transformation by itself, other team members were more in favor of the global team as a support organization, enabling others in existing organizational structures to drive the digital transformation more locally. One team member claimed:

> I'm not saying we should be a function and I'm not saying that we shouldn't be a support department, but I get a little bit lost in the frameworks and what we are, and what we're enabling, and what we're actually driving. (#2)

The researchers organized a first ADR workshop in September 2018, acting as facilitators and focusing on how research could help understand the role of the global digital team. During the workshop, the ADR team reached an agreement around 4 key objectives. But what emerged from this workshop were a lot of "A or B" discussions about the current versus the future operating model, or global versus regional decision-making power. This kind of either/or thinking was reflected in the way of working as well:

> Right now, there is this notion that someone is right and someone is wrong, and if we let them see the light, everything will be ok. And I'm not saying that the global team believes it's right, and the regional team needs to see the light, or vice versa. And I think they feel exactly the same way. It's clearly not a successful formula. (#1)

As a result, the definition of the problem instance evolved from focusing on the role of the digital team – one area where tensions surfaced – to focusing more broadly on the tensions linked to the digital transformation of Arcadis. This is when the researchers introduced the notion of paradoxes, and the ADR team decided to actively identify digital transformation paradoxes at Arcadis as a solution to move away from the current either/or mindset.
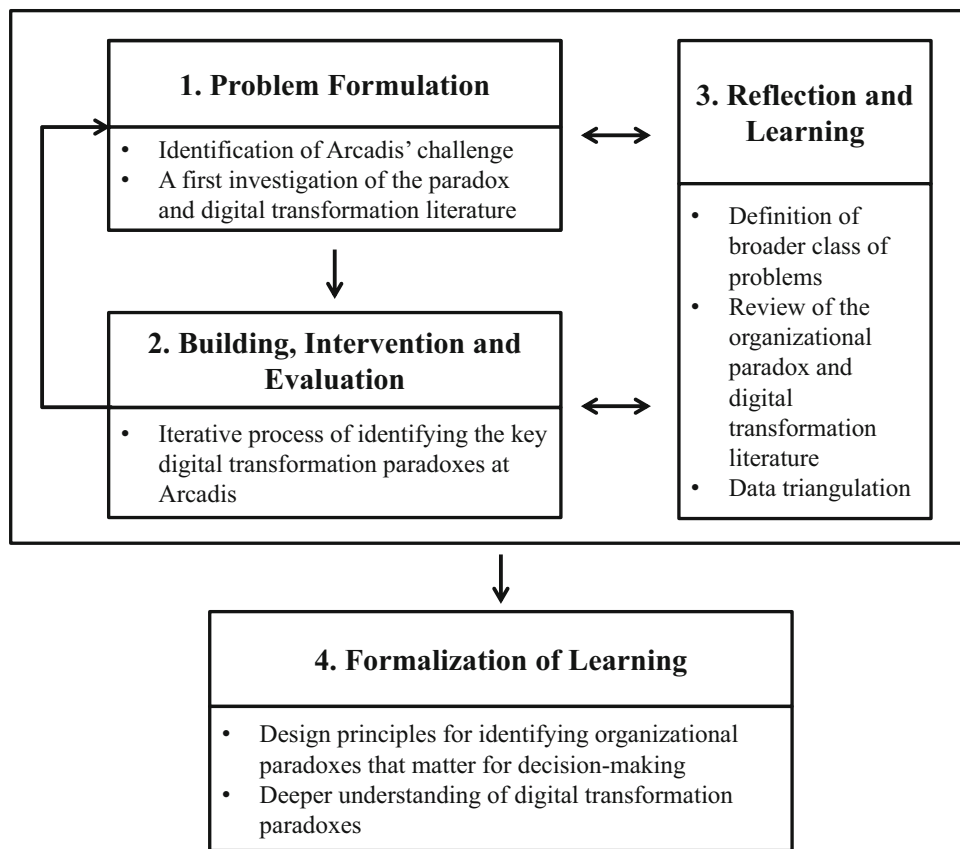
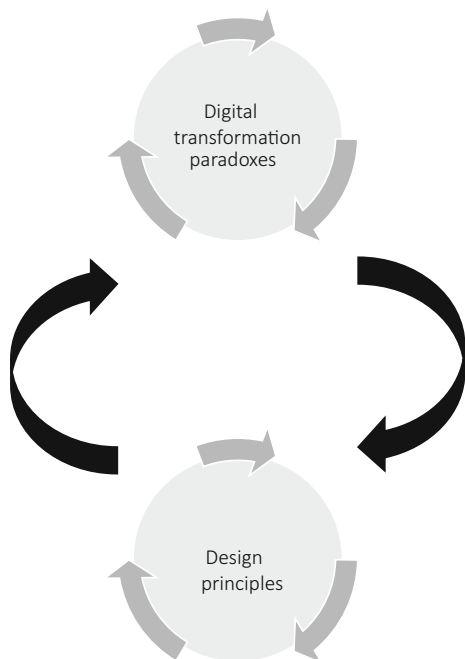**Fig. 2** ADR method: stages and principles (Sein et al. 2011)

Fig. 3 Co-evolution between digital transformation paradoxes and design principles

4.2 Building, Intervention, and Evaluation (BIE)

The ADR team performed a first exploratory identification of paradoxes in the second ADR workshop. The adoption of the paradoxical mindset made the ADR team – i.e., the researchers and global digital team members – realize that other (regional and business) perspectives also needed to be included in the paradox identification process:

> This is a very good discussion. We need to change the scope of the people involved in that discussion […] I would find it disturbing not to include my colleagues from America, Europe, Asia, and GEC in the discussion. (#1)

At the end of the second ADR workshop, it was decided that all members of the global digital team and selected other key employees from different regions and business lines would take part in an individual follow-up call to further identify the paradoxes. Around the same time, something shifted in the relationship between the global and regional digital teams as well, which is illustrated in Fig. 1. Previously, the regional digital teams would serve as replications of the global team and as a way to spread

digital transformation decisions that were made globally throughout the organization. From now on, the relationship between the global and regional digital teams changed, and a shift in decision power took place with regions co-funding digital initiatives and a broad cross-section of employees contributing to the co-creation of Arcadis' new vision. Although global and regional teams continued to exist, they now formed the extended digital team, and digital transformation decisions were made together:

> We restructured the team by opening it up to the regions, […] this also leads then to an integrated budget. Really thinking of where we want to be next year, as one digital management team. (#4)

A long list of themes and selected quotes from the interviews held with 15 selected key employees to identify the paradoxes at Arcadis were discussed with the extended ADR team in the third workshop. Although the insights were recognized by the ADR team members and all team members realized that identifying the paradoxes was necessary, the list was considered too long and too vague to act on. As part of the workshop, the ADR team dealt with two of the themes in the long list ("global and regions", and "internal and external communication of the digital program"), discussing crucial decisions to be made for each theme. Making the abstract themes more concrete in the form of actual decisions to be made, fueled a discussion on the phrasing of the paradoxes which went beyond what would normally be expected as part of an iterative design process. Surprisingly, the discussion centered on which of the two poles of each paradox to put first. As paradoxes are "A and B" statements, promoting the adoption of a both/and mindset, it was interesting to see that some sort of preference for one of the poles remained for each of the team members. The most concrete decision made in this third ADR workshop was that the long list of themes would have to be shortened to a couple of key paradoxes, but the most notable insight emerging was that identifying paradoxes led to sensitivities and that the either/or mindset remained present to some extent.

With the input from the third workshop, the researchers identified 4 key paradoxes. Given the sensitivities that surfaced during the third workshop, the researchers decided to only focus on those tensions which were linked to strategic choices made by the company (such as providing people with new skill sets in their function as a result of the people-centric culture, and the ambition to strive for global reach). The 4 key paradoxes were presented to the ADR team in the fourth workshop. Even though the key paradoxes only focused on tensions linked to strategic choices, the sensitivities that came up in the previous workshop resurfaced. This time suggestions were made to change the order of the 4 paradoxes, putting the most important

paradoxes in the top, and to further adapt the phrasing of one paradox. This showed that when identifying paradoxes it was very important in which way the paradoxes were phrased – in terms of focus, language, and order – in order to address sensitivities and to gain their acceptance by all stakeholders.

Interestingly, using the paradoxes to look back at decisions made and initiatives taken helped to see that, in hindsight, more progress had been made than expected in adopting a paradoxical mindset. Mapping decisions made in the past showed very concretely what a both/and approach enabled the company to achieve. The idea emerged to also use the paradoxes for decisions to be made in future, and to reflect on how each decision would contribute to a paradoxical mindset. During the third workshop, a discussion started on how the paradoxes were reflected in the strategy, and some comments stated that the strategy and paradoxes did not fully match. In follow-up discussions between the researchers and the CDO, the paradoxes were used to adjust the strategy such that it better reflected the paradoxical mindset. This also led to some last refinements in the phrasing of the paradoxes, resulting in the 4 key digital transformation paradoxes at Arcadis. We present this final version of the artefact in Table 5 together with illustrative quotes from the interviews and workshops.

The tension between the global team and the regions is a core tension in all four paradoxes. In addition to global strategy and regional entrepreneurialism (P1), there is a mostly global push for building new capabilities and a regional need to keep doing well in the current business (P2), a predominantly regional desire to take everyone along and a global aim for radical change (P3), a typically regional cry for clear communication and a global insight that expecting a clear direction is difficult when knowledge about digital transformation keeps evolving (P4). This unexpected preference for one of the poles of seemingly balanced "A and B" paradoxical statements surfaced for the first time during the third ADR workshop, but kept resurfacing in all future discussions. To address the sensitivities, the ADR team explicitly chose to alternate which pole to put first so that global and the regions were equally in the foreground.

The key paradoxes were identified by the ADR team as those paradoxes that matter for digital transformation decision-making, which already implies an evaluation of the paradoxes. Additionally, we evaluated the agreement with the paradoxes more formally as part of the BIE stage, see Table 6. All paradoxes got a mean score of at least 3.5 on a 5-point Likert scale and 3 out of 4 governance paradoxes scored 4.3 or higher. We believe that the high buy-in of all governance paradoxes is caused by the way in which they were developed, through continuous and systematic

interaction (i.e., ADR-driven) with researchers and a broad group of stakeholders within the organization. Although all four paradoxes resurfaced time and again during the 2-year research project, this does not mean that all paradoxes were equally accepted by all team members. Especially for the paradox 'clear communication and continuous learning', acceptance seems to vary among the team members.

Table 5 Key digital transformation paradoxes at Arcadis

	Paradox	Explanation	Interviews and workshop quotes illustrating the paradox
P1	Global strategy and regional entrepreneurialism	Arcadis wants to reach global scale with its digital transformation initiatives, but because of fragmentation, not all global initiatives are equally relevant for each region. At the same time, Arcadis wants to give enough degrees of freedom to the regions for coming up with entrepreneurial initiatives, but without compromising the focus of the global strategy	*"The philosophy shouldn't always be that it should be just one thing that should be globally applicable. Each of the regions, or at least the big regions are big enough to sustain a large group of clients with their platform and product." (#10)* *"So, because of fragmentation everyone wants to do everything everywhere, […] they're not bothered to duplicate a capability because it's more important for them to control that capability than to deploy an enterprise-wide capability. And they will always prioritize control over enterprise-wide optimization because we are not incentivized to do enterprise-wide optimization." (#1)*
P2	Build new capabilities and perform in current business	Combining exploration and exploitation in a consulting business with a time-based revenue model results in conflicting demands to deliver on short-term results and at the same time develop new capabilities for the future. It makes it hard to free up billable time for new capability building and, once acquired, to apply the new capabilities if the old business is still very profitable	*"We get a lot of people excited about digital, and we find a lot of really interesting talents […] But the thing is, they are all 100% tied into their current roles which are not digital at all. The question is: how can we leverage these existing digital capabilities in a feasible way?" (#4)* *There are hardly any people within our organization, […] who are dedicated to making this digital transformation happen. It's just an on-top activity or job which they have in their current environment, and that also puts a lot of tension and stretch on people." (#12)*
P3	Take everyone along and aim for radical change	The global strategy is to go for radical digital transformation while at the same time staying true to the people-centric culture. To take everyone along, employees in the fragmented regions need to learn radically new skills in their existing functions, but do not feel part of the new directions the company is going	*"With what we're doing now, most of the people in the business will not be relevant anymore once you go through that transformation, they're only relevant to make that change and to enable it." (#7)* *"On the other hand, I keep stressing that something disruptive is annoying by definition. And what you disrupt is our [current business]." (#3)*
P4	Clear communication and continuous learning	People desire a clear direction, clear strategy, or end goal to work towards. At the same time, environmental turbulence and new insights internally about digital transformation constantly lead to new insights and new directions. Spreading a clear digital transformation vision throughout the company – and making sure that everyone knows how to contribute to it – while constantly revising that vision as a response to new realities and opportunities, is a challenge	*"I think there's been a large misunderstanding of the three horizons across the business and, also at senior leadership level. And I think sometimes we haven't had the senior leadership or executive leadership providing enough clarity on this. […]I think that comes back to the real need to provide the right priorities, right focus." (#11)* *"We need to move to a platform-based business, but we also need to understand what it means, being a platform-based business."(#6)* *"With digital, the end goal is not clear in the beginning, not even for people who give directions. How can we expect people in the business to know where it will be going? Expecting which direction it will be going (even without a specific end goal) is already very hard for people in the business." (#6)*

4.3 Reflection, Learning and Formalization

We summarized what we learned from our 2-year ADR study in formal design principles in Table 7, following Gregor et al.'s (2020) schema for specifying design principles.

4.3.1 DP1: Use a Neutral Facilitator for Identifying the Paradoxes

During the interviews, we noted that various stakeholder types (global digital team members, regional digital team members, country CEOs) tended to stress other parts of the paradox (see, e.g., the different illustrative quotes in Table 5). When we presented the different versions of the paradoxes during the workshops, we also observed that participants appreciated a neutral summary of the different positions. Therefore, we recommend using a neutral facilitator for identifying the paradoxes. This confirms previous research by Lüscher and Lewis (2008) who argue that a neutral facilitator "provokes discussions that disrupt ingrained modes of thinking" and "supports the sense-making process from a viewpoint unencumbered by daily management responsibilities". We would like to add that the facilitator should have some familiarity with the company and should be trusted by the different stakeholders. Our prolonged relationship with Arcadis often helped us to better understand the issues at play, and to gain the trust of the interviewees – who often used words such as "I'm going to be honest and say…" or "in my personal view" – for discussing sensitive issues. We found that our ADR approach worked well for "consistently embed[ding] multiple, often inconsistent perspectives" (Smith et al. 2016) and for challenging the team members' use of the paradox terminology.

4.3.2 DP2: Mindful Wording and Explicit Balancing

The paradox literature did not provide us with guidance on how to phrase the paradoxes, beyond defining what a paradox is and which categories there are (Smith and Lewis, 2011; Smith et al. 2016). Since most paradox research does not focus on formulating the paradoxes in such a way that they will be accepted and used for decision-making within the organization (except for Lüscher and Lewis 2008), no attention has been paid to sensitivities when identifying paradoxes. In our ADR project, however, the paradoxes identified by the researchers had to be adapted multiple times. During the workshops, we had recurring discussions on how to phrase each paradox, and which of the two poles to put first to address the sensitivities of certain parts of the fragmented organization. We recommend to pay sufficient attention to a mindful description of the paradoxes, reusing wording commonly used in the organization, and balancing which pole to put first.

4.3.3 DP3: Select the Most Important Paradoxes to be Addressed in the Specific Strategic Context

Another challenge for identifying paradoxes, linked to the sensitivities underlying DP2, was to select the most important paradoxes to address. We identified a long list of over 100 themes, which indicates that identifying every latent or salient paradox is a difficult exercise. In addition, considering the different sensitivities linked to each paradox, it quickly became an unproductive exercise. Therefore, we recommend focusing managerial attention on those paradoxes that are of strategic importance to the organization. We found that paradox acceptance was higher for paradoxes linked to strategic choices. For example, P3 is linked to two clear strategic choices at Arcadis: considering people as the most important asset, and the ambition to become a digital frontrunner. As a consequence, we argue that, although paradoxes by

Table 6 Evaluation of the digital transformation paradoxes at Arcadis

Paradoxes	Fully agree	Partly agree	Neutral	Partly disagree	Fully disagree	Mean	SD
Build new capabilities and perform in current business	#1, #4, #6, #7, #8, #13	#3, #12, #15	#11			4.5/5	0.71
Take everyone along and aim for radical change	#3, #4, #6, #7, #15	#8, #11, #13	#1, #12			4.3/5	0.82
Global strategy and regional entrepreneurialism	#4, #6, #7, #8	#1, #11, #12, #13, #15	#3			4.3/5	0.67
Clear communication and continuous learning	#7, #13	#6, #8, #11	#1, #4, #12	#3, #15		3.5/5	1.08

Table 7 Design principles for identifying paradoxes

Aim, implementer and users	For designers and researchers to identify those paradoxes that matter for decision-making by people in the organization who lead the …	
Context	Digital transformation ….,	
Mechanisms and rationale	DP1 use a neutral facilitator familiar with the organization for identifying the paradoxes …	Because (1) it "may be more effective when [the sensemaking process] is led by an external facilitator" (Lüscher and Lewis 2008); and because (2) doing so "consistently embed[s] multiple, often inconsistent perspectives" (Smith et al. 2016)
	DP2 Be mindful of the wording and explicit about the balancing requirements of the paradoxes …	Because identifying paradoxes in an organizational context uncovers sensitivities
	DP3 Select the most important paradoxes to be addressed in the specific strategic context …	Because (1) identifying all paradoxes quickly turns into an unproductive exercise; and (2) paradox acceptance is higher for paradoxes linked to strategic choices
	DP4 Use the paradoxes to continually pull people out of their entrenched perspectives (by showing the validity of the different perspectives to all stakeholders involved) …	Because periodic reviews "to re-examine taken-for-granted frames or in times of change" contribute to creating a paradoxical mindset (Lüscher and Lewis 2008)
	DP5 Use the paradoxes as a mechanism to steer digital transformation decision-making …	Because it fosters a receptive response to the tensions, enabling digital transformation (Soh et al. 2019)
	DP6 Periodically map progress made over time for the two poles of each paradox …	Because it shows how successful the organization has been in using a paradoxical approach

definition remain stable over time, the set of key identified paradoxes can change over time, in pace with changes of the strategic focus and choices of an organization.

DP4: Continually Pull People out of their Entrenched Perspectives

Previous paradox research argues that bringing people together can cause paradoxes through processes of social construction (Schad et al. 2016). In our research project, actively identifying paradoxes together with different stakeholders caused the opposite dynamic, pulling people out of their entrenched perspectives and forcing them to look at problems from the other's point of view. In the last ADR workshop, the participants recognized that they had learned a lot about each other's viewpoints during the paradox identification process:

> The regions understand now that it makes sense to do things globally sometimes, but they also want to see their needs met in terms of urgent opportunities or project-based development they need to offer their clients. (#3)

However, showing the validity of the different perspectives to all stakeholders involved was an exercise we had to repeat multiple times during the ADR process. This corroborates Lüscher and Lewis' (2008) finding that a periodic review is needed to "re-examine taken-for-granted frames or in times of change", and that people need to be continually pulled out of their entrenched perspectives in order to create a paradoxical mindset.

4.3.4 DP5: Use the Paradoxes as a Mechanism to Steer Decision-Making

What recurred in the workshops time and again were discussions about the need for clear roles and responsibilities. While the paradoxes did not provide a ready-made answer, they were used as a mechanism steering decision-making by raising the question: What (future) strategic choices need to be made for each pole of each paradox? Often, this revealed that initiatives had been launched for only one of the poles of a paradox. We recommend using this approach to foster a receptive response to the tensions, enabling digital transformation (Soh et al. 2019).

4.3.5 DP6: Periodically Map Progress

Although the paradoxes sometimes brought polarization by revealing sensitivities, they were especially appreciated by the ADR team members as a tool to visualize the progress made over time on the way towards a paradoxical mindset. Throughout the ADR trajectory, we noticed that the discourse at Arcadis tended to focus on one of the poles only, often the one linked to the global perspective, and that regional perspectives were still seen as an opposing force. Referring to the paradoxes and explicitly mapping the progress made over time clearly visualized both poles as two equally important tracks. We performed an exercise in the last ADR workshop where we mapped progress made over time for the two poles of each paradox, and noticed

that this caused an appreciation with all team members of what they had accomplished, evidenced by comments such as "*in the last couple of months, we have made a lot of progress*", or "*think about where we were 9 months ago, where we are now, and what we did differently to address that tension*".

5 Discussion and Outlook

Although the organizational paradox literature recognizes the importance of both aspects, more attention has been paid to how to cope with paradoxes (Adler et al. 1999; Huy 2002; Smith 2014; Smith and Lewis 2011; Schad et al. 2016) rather than how to identify them (Lüscher and Lewis, 2008). In some settings, however, the paradoxes that are at play may be less apparent than in other contexts. Our study takes a design perspective for identifying and using paradoxes for decision-making in collaboration with an organization. Our ADR research provides two types of insights: it generates design knowledge on how to identify organizational paradoxes, and it enhances our descriptive understanding of digital transformation paradoxes (Gregor and Hevner, 2013; Vom Brocke et al. 2020).

5.1 Design Knowledge about How to Identify Organizational Paradoxes

During the ADR process, the digital transformation and paradox literature helped us to structure the problem and find possible solutions, but we found very little prior guidance for the actual design process. The first type of insights from our study comes therefore from the design knowledge or prescriptive knowledge (Gregor and Hevner, 2013; Vom Brocke et al. 2020). The design principles (DP1-DP6 in Table 7) provide concrete guidelines on how organizations can identify those organizational paradoxes that matter for decision-making. Although we developed the design principles in the context of digital transformation, our ADR approach was aimed at also addressing the general problem of identifying organizational paradoxes in other turbulent environments. The design principles corroborate Lüscher and Lewis (2008) when it comes to neutral facilitation (DP1) and continually pulling people out of their entrenched perspectives (DP4). However, they add new practical design knowledge regarding the phrasing (DP2) and selection (DP3) of the paradoxes, and on how to consider paradoxes in decision-making (DP3-DP6). Collectively, the six design principles build the foundation for a design theory for identifying paradoxes and considering them in decision-making.

When we formalized the design knowledge in the form of design principles, we made two observations on identifying organizational paradoxes for decision-making. First, we found that using paradoxes for decision-making makes the formulation process dynamic, because the paradoxes have to be accepted for use throughout the organization. Previous research – where paradoxes are described by researchers and not used throughout the organization – does not give many insights into the formulation process and describes paradoxes as stable over time. Schad et al.'s (2016) call for more research on paradox dynamics is focused on how paradoxes with a fixed formulation go through a cycle of staying under the radar before they (re)surface again. In our ADR approach, however, the phrasing of the paradoxes was in constant evolution. Questions such as 'Which phrasing can be agreed upon by everyone?', or 'Does this phrasing have the same meaning for everyone?' came up in every workshop. What we report in Table 5 is therefore a snapshot linked to a specific point in time. We argue that, to identify paradoxes for decision-making, research on paradox dynamics should also focus on the dynamics in the phrasing of the paradoxes. Second, organizational paradox research discusses how collaboration between actors with different views or perspectives can trigger paradoxical tensions (Schad et al. 2016). Our research points to an opposite dynamic, where identifying those organizational paradoxes that matter for collaborative decision-making – with a range of different stakeholders – can pull people out of their entrenched perspectives and force them to look at problems in each other's way. At Arcadis, during the paradox identification process, a shift took place from either/or thinking and "*the notion that someone is right and someone is wrong*" to both/and thinking which enabled participants to learn about each other's viewpoints.

5.2 Deeper Understanding of Digital Transformation Paradoxes

We found the ADR method conducive for studying digital transformation paradoxes, as it was well-suited for making sense of seemingly incongruent perspectives which we encountered in practice. By using ADR, we were able to openly discuss and identify organizational paradoxes with practitioners and make an academic concept accessible, actionable and practical. The manufactured paradoxes and design principles provide a helpful tool for managers and other organizational actors to not only become aware of paradoxes in their daily lives, but also to help them find a common language to use digital transformation paradoxes for decision-making in their context.

More generally, we aim to make a case for more ADR to study digital transformation. Vial's (2019) review of digital transformation literature draws attention to the fact that all firms – not only those using ecosystem or platform

strategies – must find ways to "balance the demands of multiple parties as well as the respective frames of reference that guide their perception" (Vial 2019). The author argues that one of the key areas where research on digital transformation is lacking is in "accounting for the conflicting demands of value co-creators" (Vial 2019). Research on digital transformation paradoxes (Gregory et al. 2015; Svahn et al. 2017; Tumbas et al. 2018; Soh et al. 2019; Wimelius et al. 2021) has exposed some of the conflicting demands that deserve our attention, and suggested strategies for coping with them. With our application ADR, we were able to promote working with such paradoxes in practice. We provide an answer to Vial's (2019) call for research by showing how organizations can use paradoxes for decision-making that balances addressing disruptive external forces, current and future firm performance, and the demands of multiple parties.

Through our design approach, we challenge two assumptions held in previous research on digital transformation paradoxes. First, previous research introduced paradox as a theoretical lens for explaining complex transformations, rather than as a practical means for enabling such transformation. Previous studies have paid attention to the organizational context using methods such as longitudinal case studies (Gregory et al. 2015; Tumbas et al. 2018) and grounded theory (Svahn et al. 2017; Soh et al. 2019; Wimelius et al. 2021). Our study complements this by using an ADR method based on intervention and learning in practice. As a result, we promote digital transformation paradoxes from being a theoretical concept to one that also can – and should – be identified and used for decision-making in practice. Second, previous research argues that paradoxes remain stable over time (Smith and Lewis 2011). We make a case for actively identifying paradoxes together with organizations. By doing so, we find that the paradoxes that are used for decision-making evolve.

Our approach promotes a different view on what knowledge about paradoxes is, and how it is created and used. Previous research has mainly taken an interpretive stance, with the purpose to understand digital transformation paradoxes as an interesting concept. We take a pragmatist's stance, "aiming for constructive knowledge that is appreciated for being useful in action" (Goldkuhl 2012). We argue that more methodological diversity reflecting a range of different research philosophies is necessary, and that especially pragmatism and interventionist approaches aimed at learning in practice are indispensable in the digital transformation context.

The paradox types distinguished by Smith and Lewis (2011) did not take a leading role in the design process of our study. However, we observe – as a post-hoc interpretation – that learning and belonging paradoxes occupy a central position. We argue that learning is an undeniable part of every digital transformation paradox, as tensions related to the learning organization – the need to constantly adjust, renew, change and innovate – were embedded in all paradoxes we identified. P1 comprises the tension linked to combining a common focus and economies of scale with flexibility and agility. P2 is about building new capabilities for the future – and applying them at scale – while delivering on short-term results in the successful current business. P3 deals with the tension caused by a turbulent environment that requires adaptation and change, without forgetting who you are or losing a clear view of your purpose. P4 has to do with being able to continuously incorporate new insights and new directions while still putting forward a clear direction and strategy for the firm. Most paradoxes also show belonging tensions: the tension between making individual employees feel part of the company and aiming for a radically different future for the company (P3), the tension between catering to the identity of different parts of the company (in this case: regions) and still driving a global digital transformation strategy (P1), and making sure that everyone knows how to contribute to the digital transformation vision while constantly revising that vision as a response to new realities and opportunities (P4). Previous research on digital transformation paradoxes (Soh et al. 2019) found one paradox for each type distinguished by Smith and Lewis (2011), but did not find the same omnipresence of learning and belonging tensions as we did. We want to stimulate more research that pays attention to learning and belonging tensions. We suspect that the observed omnipresence is not only linked to our case context, and that questions related to learning and identity – and especially the combination of the two – seeded by the tensions we discussed above deserve more attention.

5.3 Limitations and Further Research

We used an ADR approach to identify paradoxes and considered them in decision-making in the context of one organization, which comes with limitations. First, the organizational context in which we identified the paradoxes had certain characteristics which made it ideally suited for identifying paradoxes. Other research should validate the projectability of our paradoxes and design knowledge towards other contexts. Furthermore, it should also

investigate whether some contexts are better suited for identifying paradoxes, or have a higher need for doing so. Second, due to our ADR approach which focuses on design in use, identification and use of the paradoxes were intertwined. Although we consider identifying and evaluating paradoxes in their organizational setting as valuable, it can also be regarded a limitation. Future research can build on this by separating identification and use of the paradoxes. Third, we identified digital transformation paradoxes at the organizational level. Future research can build on this by further developing our design theory, testing our design principles, and investigating whether they also hold at other levels. How can ecosystems identify paradoxes and consider them for decision-making at the inter-organizational level? How do individuals or smaller teams identify and use paradoxes for decision-making?

We see several other promising avenues for further research on paradox identification. First, more research is needed to unpack the paradox identification process. For example, future research can add a temporal dimension, by studying the evolution of identification over time, and add an explanatory dimension that looks for the generative mechanisms driving such an evolution. Second, more research is needed to study the relationship between collaboration and paradoxes: When does collaboration lead to more paradoxical tensions, and when does collaboratively identifying paradoxes lead to better collaboration? Third, further research on monitoring or forecasting tools for paradoxes will help those organizations that want to use paradoxes in decision-making.

We also see several promising avenues for extending the research on paradoxes in the digital transformation context. First, with the help of this study, we hope to promote more research that treats paradoxes not just as a theoretical concept, but as one that can be identified together with practitioners and that can be used for decision-making in practice. In general, we hope to promote more interventionist approaches aimed at learning in practice about digital transformation (through ADR, but also other forms of pragmatic research, or even interpretivist research incorporating pragmatic elements). More diversification in the methods studying digital transformation and paradoxes will lead to more diverse insights, and has the potential to challenge assumptions of current research. Second, we aim to stimulate research on learning and belonging tensions in digital transformation, such as continuously incorporating new insights and new directions while still putting forward a clear direction and strategy for the firm, and making sure that everyone feels part of an organizational context that keeps adapting and changing. Are these tensions present in all digital transformation programs, or are there specific root causes? And how can organizations deal with learning and belonging tensions? How do they address this in their

digital strategy, governance, structure and culture, leadership and employee roles, and skill development?

6 Conclusion

For this study, we took a design perspective for identifying organizational paradoxes in the context of digital transformation. We presented the results of a 2-year action design research (ADR) study together with Arcadis, a global consulting firm in the construction industry. We provided a solution for Arcadis' problem – i.e., how to identify digital transformation paradoxes and consider them in decision-making – in such a way that it improved the general understanding of how to initially identify organizational paradoxes and use them in decision-making. As a result from the ADR process, we propose design principles for identifying and using organizational paradoxes for decision-making. By identifying the key paradoxes at Arcadis, we also contribute to the descriptive understanding of digital transformation paradoxes, highlighting the importance of learning and belonging tensions and promoting a different view on what knowledge about paradoxes is, and how it is created and used.

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