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DIGITAL TRANSFORMATION IN AN INCUMBENT ORGANISATION

The Co-Enactment of Digital Transformation
Through Macro- and Micro-level Activities

Markus Philipp Zimmer



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YLIOPISTO**
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Markus Philipp Zimmer

University of Turku

Turku School of Economics
Department of Management and Entrepreneurship
Information Systems Science
Doctoral Programme of Turku School of Economics

Supervised by

University Lecturer Jonna Järveläinen
Turku School of Economics
University of Turku
Finland

Professor Hannu Salmela
Turku School of Economics
University of Turku
Finland

Associate Professor Marko Niemimaa
Department of Information Systems
University of Agder
Norway

Associate Professor Abayomi Baiyere
Department of Digitalization
Copenhagen Business School
Denmark

Reviewed by

Professor Margunn Aanestad
Department of Information Systems
University of Agder
Norway

Professor Matti Rossi
Department of Information and Service
Management
Aalto University School of Business
Finland

Opponent

Professor Matti Rossi
Department of Information and Service
Management
Aalto University School of Business
Finland

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“Ode to joy.”
(Friedrich Schiller 2019/1785)

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Department of Management and Entrepreneurship

Information Systems Science

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The Co-Enactment of Digital Transformation Through Macro- and Micro-level Activities

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ABSTRACT

Digital transformation forms an important organisational response to digital technologies and their potential digital disruptions. Especially incumbent organisations face the risk of a diminished market position if they fail to digitally transform as competitors use of digital technologies disrupts business models and affects consumer behaviour. Digital disruptions pressure incumbent organisations' brick and mortar businesses and have already shaken established companies to the ground (e.g. Nokia or Kodak), while pushing others to the brink (e.g. the music industry). These downfalls and trends signal the importance of incumbent organisations engaging in their digital transformation in order to retain their market position.

By engaging in their digital transformation, incumbent organisations seek to implement significant changes to their methods of organising by combining multiple digital technologies. The literature on organisational digital transformation sketches three areas of concern: digital transformation strategy, organisational changes (to both value proposition and internal structures) and digital technology. Across these areas of concern, it has delved into organisational activities at either the macro or the micro level of organising. Macro-level studies seem to overshadow the importance of micro-level activities that underlie them. That is, focusing on a phenomenon's grand scheme, such studies pay little attention to the micro-level activities that enact the phenomenon. On the other hand, micro-level studies tend to miss the relation and influence that a macro-level phenomenon has on the micro level and its constitution of the macro level. They focus on the micro-level activities, neglecting the broader rules and resources that macro-level activities provide. Conceiving digital transformation as a mixed-level phenomenon occurring at both and across the organisational macro and micro levels, we thus cannot fully understand its enactment focusing on either macro- or micro-level activities but only through studying their co-enactment.

This dissertation investigates how organisational activities co-enact digital transformation. Drawing on three theoretical angles – improvisation theory, institutional theory and digital infrastructures, it studies organisational activities within the literature's three areas of concern. Acknowledging the mixed-level nature of digital transformation, it focuses on activities at both the macro and the microlevels of organising. Methodologically, it builds on an ethnography of a large European car manufacturer, an incumbent in its field, which engages in its digital transformation. This ethnographic study took place over a period of three years (from July 2017 to June 2020) and comprised participant observations and both formal and informal interviews as well as the collection of archival records.

The findings from the empirical material revealed an interplay between macro- and micro-level activities which co-enacts the car manufacturer's digital transformation. Conceptualising this interplay, this dissertation contributes to digital transformation research offering the concepts of framing and concretising to understand and explain the becoming of digital transformation as co-enactment. Framing creates space and projects direction for digital transformation. Concretising renders propositions and realisations which manifest organisational digital transformation. Accordingly, digital transformation becomes co-enacted in an interplay of macro-level activities framing micro-level activities, and micro-level activities concretising macro-level activities. The co-enactment conceptualisation emphasises digital transformation's mixed-level nature, thus proposing the need to observe approaches suitable to further unpack and better understand the phenomenon's becoming through the interplaying activities of framing and concretising.

KEYWORDS: Digital Transformation, Organisational Activities, Institutional Theory, Improvisation Theory, Digital Infrastructures, Ethnography, Automotive

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TIIVISTELMÄ

Digitaalinen transformaatio on merkityksellinen organisationaalinen reaktio digitaalisiin murrokseen, jotka digitaaliset teknologiat ovat mahdollistaneet. Jos vakiintuneet organisaatiot epäonnistuvat muuntautumaan digitaalisesti, kun niiden kilpailijat luovat uusia liiketoimintamalleja ja vaikuttavat kuluttajakäyttäytymiseen, niille markkina-asema voi mahdollisesti heikentyä. Digitaaliset murrokset painostavat vakiintuneessa markkina-asemassa olevien organisaatioiden kivijalkaliiketoimintaa, koska ne ovat jo murskanneet etabloituneita yrityksiä (esim. Nokia tai Kodak) sekä ajaneet toisia ahtaalle (esim. musiikkiteollisuus). Nämä kukistumiset ja suuntaukset viestittävät vakiintuneessa markkina-asemassa oleville organisaatioille digitaaliseen transformaatioon ryhtymisen tärkeyttä niiden yrittäessä pitää markkinapositionaan.

Digitaaliseen transformaatioon ryhtyessään vakiintuneessa markkina-asemassa olevat organisaatiot yrittävät toteuttaa merkittäviä muutoksia organisointiinsa yhdistelemällä useita digitaalisia teknologioita. Tutkimassa tätä prosessia, organisaation digitaalista transformaatiota käsittelevä kirjallisuus hahmottelee kolme aihealuetta: digitaalinen transformaatiostrategia, organisationaaliset muutokset (sekä arvolutapaukseen että sisäisiin rakenteisiin) sekä digitaaliset teknologiat. Näiden aihealueiden sisällä aikaisempi kirjallisuus on syventynyt joko makro- tai mikrotason organisointiin tarkastellessaan organisaation toimintaa. Makrotason tutkimukset kuitenkin näyttävät jättävän varjoonsa niiden taustalla olevan mikrotason toiminnan tärkeyden. Toisin sanoen, jos keskitytään ilmiön suureen kuvaan, tutkimukset eivät kiinnitä riittävästi huomiota mikrotason toimintaan, joka toiminnallistaa ilmiön. Toisaalta mikrotason tutkimukset taas usein eivät huomaa makrotason ilmiön yhteyttä ja vaikutuksia mikrotasoon ja makrotason rakenteisiin. Ne keskittyvät mikrotason toimintaan laiminlyöden laajemmat suuntaviivat ja resurssit, mitkä makrotason toiminnalla taataan. Kun digitaalinen transformaatio ymmärretään monitasoisena ilmiönä, joka tulee esille sekä organisaatioiden makro- ja mikrotasoilla että myös niiden välillä, emme voi ymmärtää sen toiminnallistamista keskittymällä joko makro- tai mikrotason toimintaan vaan ainoastaan tutkimalla niiden yhteistoiminnallistamista.

Tämä väitöskirja tutkii kuinka organisationaalinen toiminta yhteistoiminnallistaa digitaalista transformaatiota. Käyttäen kolmea teoreettista näkökulmaa – improvisaatioteoriaa, institutionaalista teoriaa ja digitaalisia infrastruktuureja – se tutkii organisationaalista toimintaa kolmen mainitun kirjallisuuden aihealueen sisällä. Se keskittyy toimintaan sekä organisoinnin makro- että mikrotasoilla tunnustaen digitaalisen transformaation monitasoisen luonteen. Metodologisesti se pohjautuu etnografiaan suuressa eurooppalaisessa autonvalmistajayrityksessä, vakiintuneessa asemassa toimialallaan, joka ryhtyy digitaaliseen transformaatioon. Tämä etnografinen tutkimus tehtiin kolmen vuoden aikana (heinäkuusta 2017 – heinäkuuhun 2020) ja sen aineisto koostuu osallistuvasta havainnoinnista, virallisista ja epävirallisista haastatteluista sekä kokoelmasta arkistotietoja.

Empiirisen tutkimuksen tulokset paljastivat makro- ja mikrotason toimintojen vuorovaikutuksen, jotka yhteistoiminnallistavat autonvalmistajan digitaalisen transformaation. Käsitteellistettäessä tätä vuorovaikutusta, tämä väitöskirja edistää digitaalista transformaatiotutkimusta tarjotessaan kehystämisen ja konkretisoinnin käsitteet, joilla voidaan ymmärtää ja selittää digitaalisen transformaation tulemista yhteistoiminnallistamiseksi. Kehyttäminen luo tilaa ja tuo esiin digitaalisen transformaation suuntaa. Konkretisointi tarjoaa ehdotuksia ja oivalluksia, jotka ilmaisevat organisaation digitaalista transformaatiota. Tällä tavoin digitaalinen transformaatio tulee yhteistoiminnallistettua makrotason toimintojen kehystäessä mikrotason toimintaa sekä mikrotason toimintojen konkretisoidessa makrotason toimintaa ja näiden vuorovaikutuksessa. Yhteistoiminnallistamisen käsite painottaa digitaalisen transformaation monitasoista luonnetta ja kehottaa jatkotutkimusta etsimään sopivia lähestymistapoja ilmiön esiintymiselle kehystämisen ja konkretisoinnin vuorovaikutuksessa, jotta sitä voitaisiin edelleen selvittää ja ymmärtää paremmin.

ASIASANAT: digitaalinen transformation, organisationaalinen toiminta, institutionaalinen teoria, improvisointiteoria, digitaaliset infrastruktuurit, etnografia, autoteollisuus

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“Und jedem Anfang wohnt ein Zauber inne” (en: In all beginnings dwells a magic force) (Hermann Hesse 1972/1941, Stufen)

Early in the morning of an August day in 2016, I boarded an airplane at Stuttgart airport, its destination: Turku airport. My journey to Turku, though, begun a few months prior. Completing my master’s degree, I longed for a new experience besides working in the industry. I figured that research could be the thing. Investigating different possibilities, I set eyes on an Erasmus internship and decided to join the University of Turku. Browsing the university’s website, I became intrigued by Turku School of Economics and its information systems science department. Checking the department’s people register, I realised that Jonna Järveläinen may be a good host for my internship. I compiled an email, updated my curriculum vitae and contacted Jonna. To my luck, she replied informing me that I could assist her in teaching and research activities. Excited to join her and Turku School of Economics, I thus boarded that airplane. However, I also felt anxious about my decision for this internship. Was it the right thing to do? Should I not just look for an industry job? Such questions gnawed my mind.

In the subsequent year, I realised how fortunate I was to decide for this Erasmus internship. The questions which gnawed my mind had vanished and I did not close the research chapter afterwards but continued as a doctoral student. Almost five years have passed since I boarded that airplane in the early morning of an August day. Five years within which I was blessed to explore and discover the perks and challenges of academic life. I travelled to conferences in Amsterdam, Xi’an, Cancun and Munich; joined courses in Brussels, Oslo and Kristiansand; suffered from rejects, the difficulties of fieldwork and sometimes doubted my entire endeavour. Apparently, these ups and downs are part of any research expedition. One moment you find yourself blissfully over the acceptance of an article, a sudden insight or a surprising discovery and in the next you struggle to comprehend why it is only you who can see your findings’ novelty, relevance and even brilliance (darn them reviewers). In these moments, one can consider themselves lucky if they can get by with a little help from their friends. I am glad that I was, and am, lucky. While I take the full responsibility for the content within these pages, I wish to express my gratitude to the individuals and institutions that played a significant part in my journey. If it was not for their

support, assistance and belief in my abilities, my journey to Turku may have been otherwise. Besides these individuals and institutions I met many more with whom I conversed on my journey. For all our discussions and their inspirations I am thankful.

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May 3, 2021

Markus P. Zimmer



MARKUS PHILIPP ZIMMER

is an information systems researcher interested in phenomena involving organisations and digital technology (e.g. organisational change). He conducts empirical research employing fieldwork techniques including participant observations, interviews and collecting archival records. He has delved into incumbent organisations' digital transformation, digital strategy, digital infrastructures and the digital transformation of work. Prior to being a researcher, Markus has worked in the IT, human resources, inhouse consulting and research and innovation units of international automotive and software companies.



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transformation through framing and concretising 125

List of Original Publications

This dissertation is based on the following original publications, which are referred to in the text by their Roman numerals:

- I Zimmer, M. P. 2019. “Improvising Digital Transformation: Strategy Unfolding in Acts of Organizational Improvisation,” in *Americas Conference on Information Systems (AMCIS) 2019 Proceedings*, Cancun, Mexico, pp. 1-10.
- II Zimmer, M. P., Baiyere, A., and Salmela, H. 2020. “Digital Workplace Transformation: The Importance of Deinstitutionalising the Taken for Granted,” in *European Conference on Information Systems (ECIS) 2020 Proceedings*, Marrakesh, Morocco, pp. 1-15.
- III Zimmer, M. P., Barthel, P., and Hess, T. 2020. “Traditional Trumps Digital? Competing Logics in Coordinating Digital Transformation Initiatives,” *Essay*, pp. 1-17.
- IV Zimmer, M. P., and Niemimaa, M. 2019. “Navigating in the Digital Jungle: Articulating Combinatory Affordances of Digital Infrastructures for Collaboration,” in *Pacific Asia Conference on Information Systems (PACIS) 2019 Proceedings*, Xi’an, China, pp. 1-14.
- V Zimmer, M. P., and Niemimaa, M. 2020. “Cultivating a Digital Jungle: Toward a Hybrid Governance Perspective on Infrastructure Evolution,” in *Pacific Asia Conference on Information Systems (PACIS) 2020 Proceedings*, Dubai, UAE, pp. 1-14.

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1 Introduction

1.1 Background and Motivation

Digital transformation (DT) forms an important organisational response to digital technologies' potential to disrupt businesses. Especially incumbent organisations, organisations with an established market position centred on a physical product or service (Sebastian et al. 2017), risk a diminished market position if they neglect to digitally transform as a counteract to digital disruptions. Digital disruption describes the phenomenon of an emergent technology generating performance attributes not valued by an incumbent's current customer base but often signifying eventual replacement of that incumbent as a market leader (Ganguly et al. 2010; Karimi and Walter 2015). It is not an immediate phenomenon or event but a process which unfolds over time (Wessel and Christensen 2012). Renowned examples of digital disruption and its effects on incumbent organisations are the cases of Kodak and Nokia (Lucas and Goh 2009; Vuori and Huy 2016). Kodak's downfall was rooted in digital photography replacing film cameras (Lucas and Goh 2009), and Nokia lost the smartphone race to Apple by failing to respond to the latter's iPhone (Vuori and Huy 2016). Similarly, the music industry nearly collapsed when piracy was reincarnated (Swash 2009). Forging a deal with Apple to offer music downloads on iTunes instead of selling music via other medias (e.g. CDs) (Johnson 2009; Naughton 2019), the music industry, however, paved the way for subscription-based streaming models (e.g. Spotify etc.) (Briggs et al. 2014; Moreau 2013). These nurtured the ongoing changes in consumer behaviour which again threatened the music industry as consumers desired more content for free or at a flat rate (Chen et al. 2018; Sun 2018). These downfalls and trends signalled the threat emanating from potentially disruptive digital technologies, thus stressing the importance for incumbent organisations in other industries to not downplay digital disruption but to embark on their own DT. One of these was the automotive industry.

The automotive industry is, both globally and in particular within the European Union (EU), a key industry. In 2017, it provided 7.0% of the EU's gross domestic product and employed more than 13.8 million people (i.e. 6.1% of all employment within the European Union) (European Automobile Manufacturers Association 2019, 2020). Thus, the automotive industry plays a critical role in society and the

economy in regard to providing jobs, economic growth and business taxes. Since it is a heavy asset business, the machinery, resources, and skills required for manufacturing cars demand tremendous investments, the industry has strong entrance barriers. This means that after an initial expansion at the turn of the twentieth century, which saw many of today's car manufacturers opening their first plants, new players rarely entered. Hence, most of the car manufacturers and brands that we know today have been around for more than 100 years, establishing their market position and themselves as incumbents. Yet, digital technologies changing the delivery of mobility (e.g. car sharing, ride-hailing or -sharing and autonomous driving) and a change in consumer behaviour have pressured incumbent car manufacturers (Fichtner et al. 2019; World Economic Forum 2016).

Leveraging digital technologies, new market entrants develop new business models. These business models rely not necessarily on selling vehicles, but rather mobility as a service (Fichtner et al. 2019; Seiberth and Greundinger 2018). Prominent examples are ride-hailing services such as Uber in North America, Bolt in Europe, or DiDi in China. These services do not sell cars but mobility on demand, i.e. a ride from A to B orderable via a smartphone app and thus available at consumers' fingertips (Miller et al. 2016). With consumers ordering a ride, these new market entrants not only receive a commission for each ride hailed but obtain consumer data (Brakewood et al. 2017). Therefore, despite them entering the market more than 100 years after the first car manufacturers, they hold the data with the potential to know more about consumers and their behaviour and desires on mobility than incumbent car manufacturers (Probst et al. 2017). In contrast, the latter distribute their products and services through a network of dealerships with little data integration along the sales process (Gao et al. 2016).

At the same time, consumers' concept of mobility is shifting. While the car has long been a symbol of wealth within the middle class and the means for individual mobility (World Economic Forum 2016), it has handed this symbolic meaning to smartphones and has become stigmatised as one of the culprits of climate change (Sauerbrey 2019). This shift is reflected, e.g. in the number of registered car sharing users in Germany which rose, from 2009 to 2021, from 137,000 to 2.87 million registered users: an increase of more than 2 million (Statista 2021a). In regard to purchasing luxury goods, 33% of respondents buy a premium smartphone while only 15% made the same statement for cars (Statista 2021b). These digital disruptions to business models and consumer behaviour have exerted pressure on car manufacturers to re-evaluate their brick and mortar business model of manufacturing and selling cars (Niemimaa et al. 2019). The incumbent industry players responded to this pressure by embarking on their DT (e.g. Chanas and Hess 2016; Dremel et al. 2017; Svahn et al. 2017).

DT has received significant attention in both academia and practice as the number of recent publications and industry reports indicates (Fujitsu 2018; Vial 2019; World Economic Forum 2018). In an extensive review of scholarly publications, Vial defines DT 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” (2019, p. 122). This definition outlines that, engaging in its DT, an organisation “triggers significant changes.” Significant changes are changes that entail a qualitatively different organisation (Besson and Rowe 2012). Unpacking this notion of being “qualitatively different” empirically, Wessel et al. (2020) found that organisations undertaking DT change in their identity and value proposition. Thus, their article contributes to an important debate in information systems (ISs) research on the matter of whether DT is conceptually different from information technology (IT) enabled transformation (e.g. Baiyere et al. 2019; Skog 2019). According to Wessel et al. (2020), DT alters organisations’ deep structure, their identity and value proposition, while IT-enabled transformation reinforces organisations’ deep structure. Hence, they conclude that DT is conceptually different from IT-enabled transformation.

Investigating deep structure change in DT, prior research on organisations’ DT can be divided into three areas of concern (Mathiassen 2017; Vial 2019). These are, adapting Vial’s (2019) process framework, (1) DT strategy, (2) organisational changes (to value creation and proposition (e.g. Karimi and Walter 2015; Svahn et al. 2017) as well as structures and culture (e.g. Dremel et al. 2017; Utesheva et al. 2016) and (3) digital technologies. Differentiating prior studies within these areas of concern, this dissertation distinguishes between studies which analyse organisational macro- or micro-level activities (Markus and Robey 1988).

Macro-level activities concern organisations’ abstract level of organising. They outline, e.g. organisational strategies, principles for organising or organisational structures. They address organisations’ collective, i.e. they span organisation-wide (or at least across greater parts of an organisation). Micro-level activities occur at organisations’ operational level of organising. They concern the individual and specific, e.g. the activities and practices of a specific unit, department or organisational actor. Micro-level activities are concrete practices of organising rather than abstract principles. Hence, the organisational level of an activity bears no inferences to hierarchical levels (e.g. managerial vs. employee). In fact, we may study these levels from both managerial and employee perspectives.

Applying this working definition to the three areas of concern, we can make two observations. Firstly, prior studies have thus far taken a primary interest in organisations’ DT macro-level activities. Secondly, they have analysed managerial views on organisations’ DT strategy (e.g. Matt et al. 2015; Sebastian et al. 2017), the role of the chief digital officer (CDO) (e.g. Singh et al. 2020; Singh and Hess 2017; Tumbas

et al. 2018) and how incumbent organisations, on a strategy level, accommodate and reconcile their existing brick and mortar business and their envisioned digital business (e.g. Bharadwaj et al. 2013; Karimi and Walter 2015). Scholars, however, also have found that DT unfolds in organisations’ micro-level activities (Jöhnk et al. 2020; Utesheva et al. 2016). At the micro level, DT initiatives implement macro-level strategies (Berghaus and Back 2017; Chanias et al. 2019). They manifest organisations’ DT; they enact it (Jöhnk et al. 2020; Øvrelid and Bygstad 2019).

The perspective of enactment grounds organisational change in the activities that constitute organisational life (Leonardi and Barley 2010; van de Ven and Poole 2005). Scholars employing this perspective study organisations as being in a continuous process of becoming (Thomas et al. 2011; Tsoukas and Chia 2002). That is, they treat organisational phenomena not “as entities, as accomplished events, but as enactments—unfolding processes involving actors making choices interactively, in inescapably local conditions, by drawing on broader rules and resources” (Tsoukas and Chia 2002, p. 577). While “actors’ locality” accounts for the micro level in organisational activities, the “broader rules and resources” relate to their macro level. Yet, Leonardi and Barley (2010) highlight that the enactment perspective’s focus on micro-level activities has limited its ability to explain the influence of macro-level activities on change (e.g. power relations, influential actors or change programmes). They therefore stress that we “cannot adequately explain the micro-social dynamics of technological change without considering the macro-social processes of technological change (and vice versa)” (2010, p. 42). In Markus and Robey’s (1988) words, organisational (or technological) change is a mixed-level phenomenon. While previous findings suggest that DT is a mixed-level phenomenon, existing research has primarily studied managerial views on the phenomenon’s macro level.

Perpetuating the macro-level perspective as well as the focus on managerial views, IS research is in jeopardy of developing a one-sided understanding of the phenomenon of DT (Clarke and Davison 2020; Leonardi and Barley 2010; Vial 2019). Without an understanding of organisations’ micro-level activities, in particular non-managerial views on these activities, and the linkage between macro- and micro-level activities, we are likely to fail in producing meaningful insights that can lead to improvements of and, thus, successful DT of incumbent organisations. Therefore, this research draws on the notion of organisational change being enacted through emergent activities (van de Ven and Poole 2005) but seeks to accommodate Leonardi and Barley’s (2010) recommendation to conceive organisations’ DT as becoming enacted through organisational macro- and micro-level activities. Taking this perspective, this dissertation contributes to our understanding of incumbent organisations’ DT by studying its enactment through organisational macro- and micro-level activities.

Being a phenomenon enacted through collective and emergent actions, DT is best studied and understood by entering the field, i.e. going to “where the action is” (Myers 1999). Therefore, this research builds on ethnographic fieldwork in an incumbent European car manufacturer. The foregoing discussion of the automotive industry illustrates the suitability and adequacy as well as societal and economical relevance of studying incumbent automotive organisations and how they respond to digital disruption and the resultant market forces through the enactment of their DT. DT is, however, not only a concern for incumbent organisations in the automotive industry. Incumbents in other industries, such as banking (e.g. Chantias et al. 2019), clothing and sports equipment (e.g. Hansen and Sia 2015) or toys (e.g. Andersen and Ross 2016) face respective pressures for DT.

Besides the pressure to transform, incumbent organisations across these industries share that they hold an established market position. Gaining this position has coined their identity and value proposition, the two things DT essentially affects (Wessel et al. 2020). In this regard, past research into the Kodak situation has shown that incumbents’ struggle to alter their value proposition for these alterations conflicted with their established identity (Lucas and Goh 2009). The examples of Kodak and Nokia have also shown that failure to respond to digital disruption can result in a diminished market position, if not corporate demise. Given the incumbents’ role in society and the economy, this can have widespread implications (Lucas and Goh 2009; Vuori and Huy 2016). These potential implications stress the importance and practical need to study incumbent organisations’ enactment of DT. Understanding its enactment, scholars can provide insights into successful (and unsuccessful) performance of DT. Therefore, this dissertation’s research builds on an ethnographic study in a large European car manufacturer to explore its organisational activities which enact its DT.

1.2 Research Purpose and Research Questions

As the above discussion lays out, the purpose of this treatise is to address the need for comprehensive research into DT, that is, research that blends analysis of macro- and micro-level activities enacting the phenomenon under study by drawing on both managerial and employee views, voices and actions (Clarke and Davison 2020). Markus and Robey (1988) as well as Leonardi and Barley (2010) underline the importance of combining macro- and micro-level analyses in studies on organisational transformation, especially when an organisational transformation is a mixed-level phenomenon. DT affects both the macro and the micro levels of organisations (e.g. Chantias et al. 2019; Svahn et al. 2017) and, thus, is a mixed-level phenomenon. Despite recognising the role of micro-level activities (e.g. Berghaus and Back 2017; Chantias et al. 2019; Jöhnk et al. 2020), research into DT has thus far focused on

macro-level activities and drawn primarily on managerial views. Given the dearth of research into DT that blends organisational macro- and micro-level activities, and that incorporates perspectives on DT other than managerial, this work explores *how incumbent organisations' macro- and micro-level activities enact DT*. In other words: how does DT of these organisations unfold in an interplay of macro- and micro-level activities? It contributes to our conceptual understanding of incumbent organisations' DT and offers insights for policymakers and managerial and other organisational actors.

Pursuing this dissertation's main research question, I delve into each of the three research areas of concern regarding organisations' DT. For this, I draw on three theoretical framings: (a) organisational improvisation, (b) institutional theory and (c) digital infrastructures.

Organisational improvisation defines the activity of improvising as planning unfolds in action. Organisational actors, who improvise and, thus, act on the spur of the moment, experiment by relying on their intuition (Ciborra 1999; Cunha et al. 1999; Hadida et al. 2015). Scholars have drawn on improvisation theory to study, e.g. organisational change (e.g. Cunha and da Cunha 2003; Orlikowski 1996) or strategy (e.g. Levallet and Chan 2018; Teoh and Wickramasinghe 2011). Considering the experimental nature of organisations' DT activities (Berghaus and Back 2017; Levallet and Chan 2018; Warner and Wäger 2019), improvisation theory offers an insightful lens through which to study organisational activities enacting DT strategy. Thus, the first research sub-question, which this dissertation addresses, is *how do an incumbent organisation's activities enact DT strategy through the lens of organisational improvisation?*

Institutional theory offers concepts to study organisational change both generally (Greenwood and Hinings 1996) and in the context of DT (Hinings et al. 2018). Institutions are socially constructed established orders, with taken for granted practices, actions, facts and shared understandings (Greenwood et al. 2008; Scott 2001). Organisational institutionalism provides constructs to analyse and explain institutional effects (DiMaggio and Powell 1983), institutionalisation (Zucker 1977) and organisational change (Greenwood and Hinings 1996) both on a field level and an intra-organisational level (i.e. within a single organisation). In this vein, Hinings et al. (2018) proposed institutional theory to study digital innovation and DT. This dissertation draws on organisational institutionalism as a theoretical framing to study organisational changes in the context of DT. It thus considers its second research sub-question as *how do an incumbent organisation's activities enact organisational changes through the lens of institutional theory?*

Digital technologies are one area of concern within research on organisations' DT (Vial 2019). Scholars studying digital technologies underlying DT have drawn on the concept of digital infrastructures (e.g. Constantinides et al. 2018; Fürstenau,

Baiyere, et al. 2019; Henfridsson and Bygstad 2013). Digital infrastructures are combinations of digital technologies that, unlike specific systems or applications, have neither a distinct set of functions nor strict boundaries (Tilson et al. 2010). In the context of DT, organisations reconfigure their digital infrastructures to redefine their value proposition and operational processes (e.g. Dery et al. 2017; Fürstenau, Rothe, et al. 2019; Sebastian et al. 2017). Investigating digital technologies' role in organisations' enactment of their DT, this treatise draws on the concept of digital infrastructures casting the third sub-question as *how do an incumbent organisation's activities enact digital technologies through the lens of digital infrastructures?*

As Figure 1 illustrates, each of these sub-questions, firstly, addresses a different area of concern within research on organisations' DT (i.e. (1) DT strategy, (2) organisational changes and (3) digital technology) (cf. Vial 2019), and secondly, draws on a different theoretical framing (i.e. (a) improvisation theory, (b) institutional theory and (c) digital infrastructures).

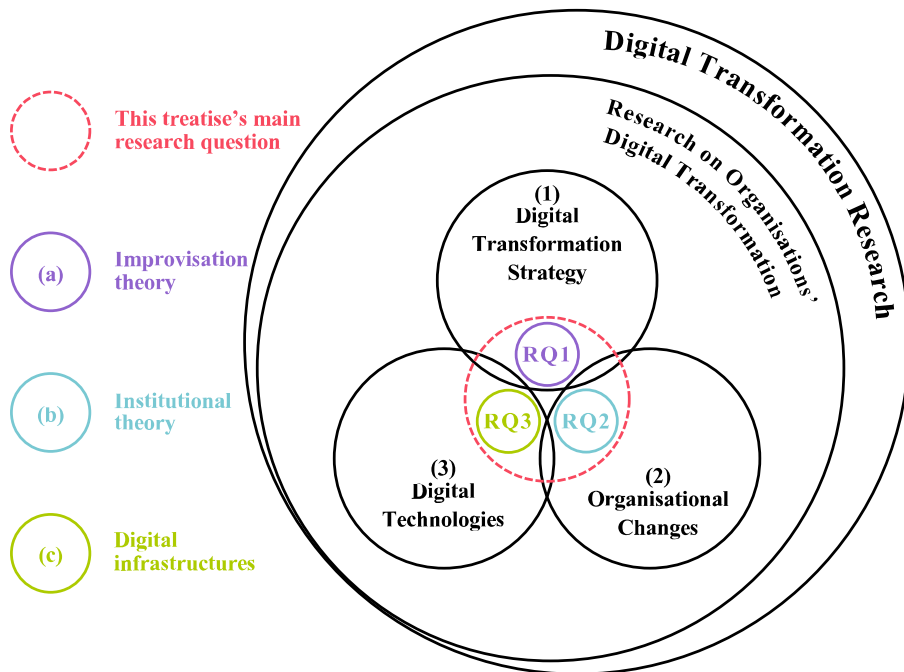


Figure 1. Illustration of the relationship amongst the research questions, employed theoretical framings and the three areas of concern within digital transformation research

In summary, to answer its main research question, this dissertation addresses three research sub-questions:

1. *How do an incumbent organisation's activities enact DT strategy through the lens of improvisation theory?*
2. *How do an incumbent organisation's activities enact organisational changes through the lens of institutional theory?*
3. *How do an incumbent organisation's activities enact digital technologies through the lens of digital infrastructure evolution?*

The research sub-questions guide the overall research process that delves into the dissertation's main research question. They assist in analytically untangling the phenomenon of DT to reveal the macro- and micro-level activities and their interplay that enact it. As typical for qualitative studies, the research process is emergent. This means that insights from studies into these research questions inform the overall research process (Maxwell 2009). In total, five empirical articles form the basis for this dissertation, thus making it an article-based dissertation.

Conducting these studies, I took an ethnographic approach entering the field by gaining access to a large, incumbent European car manufacturer (AutoCo) (Myers 2009a). Considering the research purpose, ethnographic research is well-suited to produce in-depth and insightful tales from the field (van Maanen 2011a). The nature of presenting these tales, i.e. writing about the field experiences by blending the researcher's voice and the voices of the people encountered and interacted with in the field, renders ethnographic research a powerful methodology to investigate a mixed-level phenomenon by combining different levels of analysis into one comprehensive tale (Czarniawska 1998; van Maanen 2011a). The work presented in the subsequent chapters thus builds on my ethnographic fieldwork at AutoCo published in five empirical articles. The next section provides an overview of these articles.

1.3 Overview of Articles Forming this Dissertation

In total, this dissertation builds on five empirical articles. Each of these articles is situated within one of the three areas of concern in research about organisations' DT and draws on key constructs from one of the three employed theoretical angles. Thus, although part of the same emergent research process, these articles contribute, each in itself, independently to the areas of concern in DT research. Extending these independent contributions, this dissertation draws on these articles' key findings to reveal the interplay of macro- and micro-level activities enacting the studied organisation's DT. While each article presents observations on both macro- and micro-level activities, they did not focus *per se* on these activities' interplay and how it enacts DT. This dissertation merges these observations into a separate and individual

piece of research that makes its own contribution based on the five articles’ findings. Figure 2 chronologically outlines the underlying five articles and maps them to the three areas of concern as well as the dissertation’s sub-research questions.

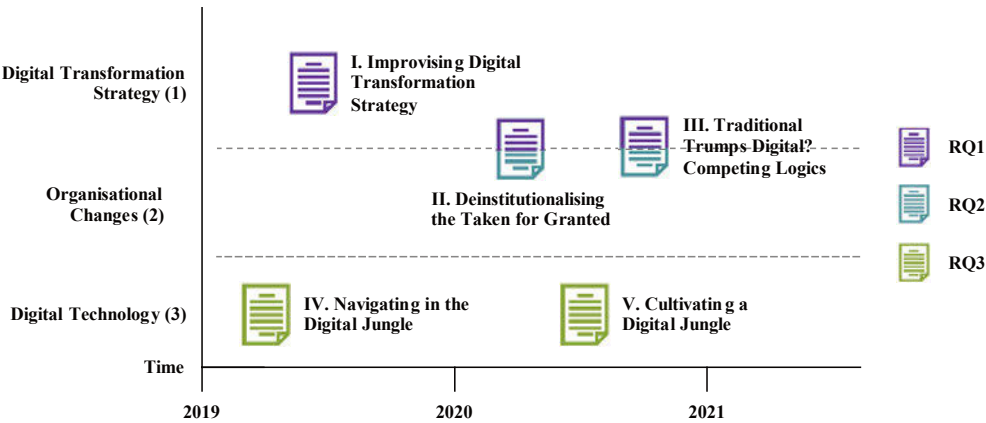


Figure 2. Chronological outline of the underlying articles by area of concern and related to the research question(s) addressed

The dissertation’s analysis of the interplay of macro- and micro-level activities thus presents its own contribution to DT research. In addition, it draws implications from and for the theoretical angles underlying the five articles’ enquiries into the three areas of concern. Implications *from* these theoretical angles are perspectives which they introduce to DT research. Implications *for* these theoretical angles are inferred from the empirical context of DT. Table 1 provides an overview of the five articles focusing on their role in this dissertation.

Table 1. The underlying five articles and their role in this dissertation

Article	Area(s) of Concern	Theoretical Angle	Role in Dissertation
I. Improvising Digital Transformation: Strategy Unfolding in Acts of Organizational Improvisation	DT strategy	Improvisation theory (Minimal structure)	Provides an empirical account of the link between employees' micro-level activities and macro-level DT strategy
II. Digital Workplace Transformation: The Importance of Deinstitutionalising the Taken for Granted	Organisational change and DT strategy	Institutional theory (Deinstitutionalisation)	Provides an empirical account of macro-level formulations of deinstitutionalising established workplace practices and entailed changes in micro-level activities
III. Traditional Trumps Digital? Competing Logics in Coordinating Digital Transformation Initiatives	Organisational change and DT strategy	Institutional theory (Institutional logic)	Provides an empirical account of micro-level changes to value creation and their legitimation through macro-level strategy
IV. Navigating in the Digital Jungle: Articulating Combinatory Affordances of Digital Infrastructures for Collaboration	Digital technology	Digital infrastructures (Infrastructure evolution)	Provides an empirical account of macro-level activities for facilitating and responding to micro-level activities of developing and using AutoCo's digital infrastructure for collaboration
V. Cultivating a Digital Jungle: Toward a Hybrid Governance Perspective on Infrastructure Evolution	Digital technology	Digital infrastructures (Infrastructure evolution)	Provides an elaboration of the empirical account in article IV investigating the macro- and micro-level activities that enacted AutoCo's digital infrastructure evolution

Except for article I, which is solely authored, I compiled all articles as the first author of a team of co-authors. In all articles, being the field researcher collecting and analysing the empirical material as well as the main author of all sections in the resulting articles, my contribution to the presented research was significant. The appendix Original Publications, with the approval of the publishers, contains the underlying five articles.

1.4 Dissertation Outline

The dissertation has seven main chapters: Introduction, Informing Literature and Selected Theoretical Angles, Research Approach, Research Site, Findings, Discussion and Implications and Conclusions. The Introduction lays out this research's background and motivation in regard to the phenomenon of DT. It formulates the research purpose and research questions, and it introduces the key theoretical framings this research draws on. It concludes with an overview of the five empirical articles underlying this treatise and an outline of the dissertation's structure.

The second chapter reviews informing literature and selected theoretical constructs. It comprises two main sections. The first section reviews prior research into organisations' DT. It is organised into the three different areas of concern presented in the Introduction. The second section brings in and describes the key constructs of the theoretical framings that guide the research process into these areas of concern. This second section involves a review of how these key constructs have been applied in prior research and their suitability to investigate the phenomenon of DT.

Chapter 3 describes and explains the research approach. It covers this treatise's foundation in the philosophy of science, its research approach within IS and respective principles, the conduct of ethnographic fieldwork in general and how I employed this methodology in collecting and analysing empirical material in the field, namely, at the research site AutoCo.

Chapter 4 then describes AutoCo. This description comprises two parts. It firstly delves into AutoCo as a large car manufacturer with its far-reaching past history, before secondly portraying its DT context. This chapter thus provides the overarching context against which the five empirical articles underlying this treatise have to be read.

Chapter 5 summarises the key findings of the five empirical articles forming this treatise. It structures this summary by the areas of concern within research on organisations' DT. This means that it presents, per area of concern, the key findings which the five studies provide to the respective area of concern.

The discussion and implications then draw on the summary of these key findings to answer this dissertation's research questions. Chapter 6 therefore contains a discussion of each research sub-question and then ties them together to answer its main research question. Further, it provides practical implications of this research and evaluates it against criteria for assessing ethnographic research.

Chapter 7 closes this dissertation with a conclusion pointing out the key arguments of this research as well as potential angles for future research into organisational DT.

2 Informing Literature and Selected Theoretical Angles

References to informing literature form “a meta-story of the topic, a trace of conversations between texts that occurred in a concrete time and place” (Czarniawska 1998, p. 63). Thus, referencing tells a story by weaving together past texts and one’s own research into a single narrative contributing to an ongoing conversation in research. In this vein, referencing the literature that has informed my research, I position my own work within the ongoing conversation in IS research on DT and toward the theoretical angles which I drew on to unpack my empirical material. This chapter outlines these angles as the conceptual foundation of my research.

2.1 Marking the Conceptual Foundation

DT as a research stream *per se* is rather broad. With my focus on incumbent organisations’ DT, I concentrated on prior research that deals with organisations’ DT. Within this focus, the existing literature can be unravelled into three research streams (or areas of concerns) (Vial 2019). These are (1) DT strategy, (2) organisational changes and (3) digital technology. In my research, I reference these three areas of concern to contribute to the respective conversations.

To identify theoretical angles, I have followed an emergent, partly inductive and cyclic research process that developed from iteratively studying my empirical material and existing literature (see 3.2.2 Empirical Material). Through this processes, three angles emerged. These are (a) organisational improvisation, (b) institutional theory and (c) digital infrastructures. Each of these angles comprises a broad array of concepts. From these, I have selected concepts that allowed me to highlight the essence in different fractions of my empirical material. These key concepts are minimal structure (organisational improvisation), deinstitutionalisation and institutional logics (both institutional theory) as well as infrastructure evolution (digital infrastructures). Jointly, prior literature in the three areas of concern in research on organisations’ DT and the selected theoretical angles form the conceptual basis informing my research. Figure 3 illustrates this conceptual foundation and the relation amongst the research areas and selected theoretical angles.

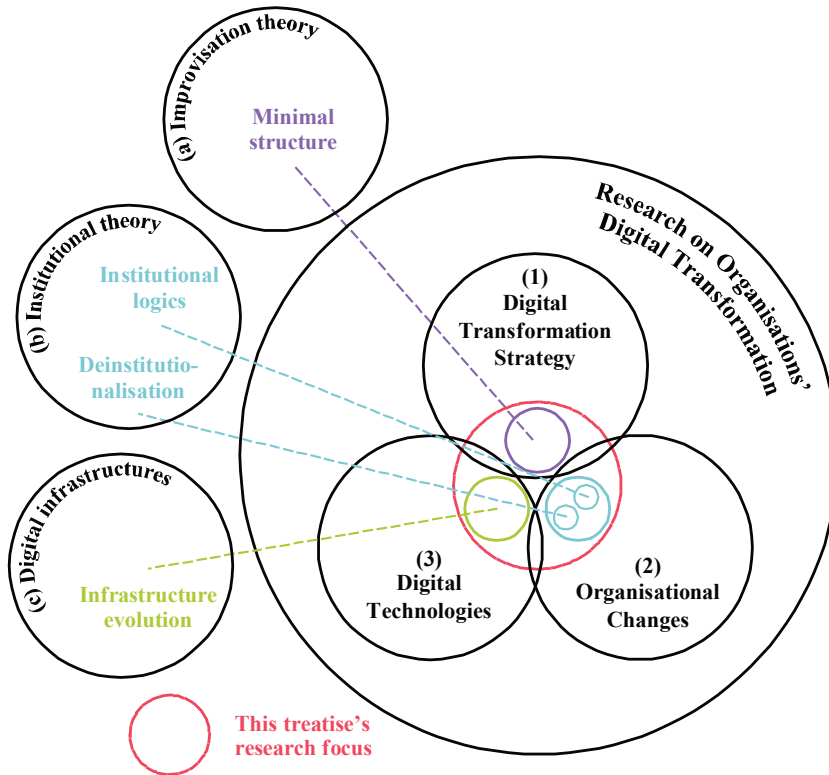


Figure 3. Conceptual foundation of this dissertation

Next, this chapter continues by first unravelling the informing literature on organisations' DT and presenting prior research in the three areas of concern individually. Subsequently, it describes the three selected theoretical angles and the key concepts per angle employed in this dissertation to study the macro- and micro-activities enacting DT.

2.2 Prior Research on Digital Transformation

The research area of DT emerged roughly in the twenty-first century’s second decade (Nambisan et al. 2019). Given its prevalence in practice, scholars and practitioners have taken increasing interest in understanding and mastering DT. Their interest is reflected in a number of recent DT reviews (e.g. Hanelt et al. 2020; Hausberg et al. 2019; Kutzner et al. 2018; Vial 2019) as well as practice-oriented publications (e.g. Fujitsu 2018; World Economic Forum 2018). In this chapter, I outline existing DT research’s areas of concern by adopting Vial’s (2019) DT process model before reviewing studies central to this treatise’s three areas of concern.

2.2.1 Digital Transformation Research’s Areas of Concern

Despite researchers and practitioners’ attention, a common and shared definition of DT remains elusive (Bockshecker et al. 2018; Hanelt et al. 2020; Hausberg et al. 2019). In my research, I adopted Vial’s definition of DT: “a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies.” (2019, p. 122). Based on an extensive review, Vial synthesised this definition from various existing definitions of DT. Further, he created a framework relating prior DT studies’ research topics. With Vial not claiming any causality amongst these topics, we can classify this framework as a process framework (Markus and Robey 1988). It characterises *digital technologies* as fuelling *digital disruptions* (of society, industries and markets) which *trigger* formulation of *DT strategies*. These strategies *rely on* *digital technologies* that *enable* *organisational changes* (to context and structures as well as value creation) which generate desired (and undesired) *outcomes*. Figure 4 adapts Vial’s process framework highlighting this treatise’s focus on DT strategy, organisational changes and digital technologies.

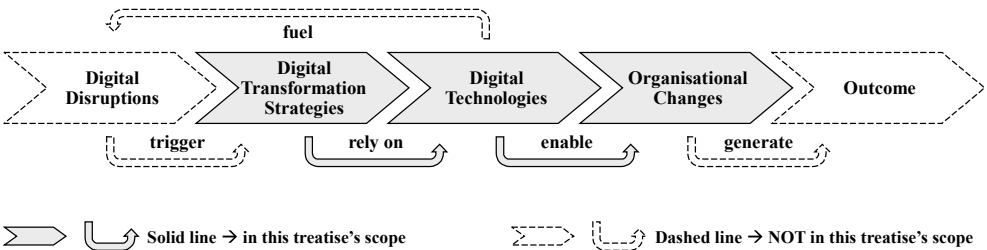


Figure 4. Digital transformation process framework adapted from Vial (2019)

While Vial’s definition contains “entity” as a placeholder for organisations, markets, industries etc., this treatise sets the boundary around organisational DT

activities. This means that it primarily draws on existing research investigating DT of organisations (not of individuals, markets, industries or society). Further, it is primarily interested in the process of organisations' DT. Reflecting this focus, Figure 4 depicts *digital disruption* and *outcome* and the related specifiers *trigger*, *fuel* and *generate*, with dashed outlines. *Digital disruptions* can be changing consumer behaviour, new market entrants or competitors leveraging disruptive technologies (cf. Haffke et al. 2016; Vial 2019). According to Vial's framework, they trigger organisational activities which form responses to such disruptions and which can be disruptive to other organisations. These responses enact DT *outcomes* which can be both negative and positive. Yet, I focus on the DT process's enactment rather than measuring or assessing its outcome.

Besides Vial (2019), Kutzner et al. (2018), Hausberg et al. (2019), Bockshecker et al. (2018), Hanelt et al. (2020) and Nambisan et al. (2019) also examined prior research on DT. However, compared with Vial, these authors took different approaches in categorising extant DT research. They structured prior studies, e.g. by industry or business function studied (Hausberg et al. 2019; Kutzner et al. 2018), employed research approaches (Kutzner et al. 2018), focusing on the socio-technical phenomenon studied (Bockshecker et al. 2018), or a specific area of concern in research (Hanelt et al. 2020; Nambisan et al. 2019). As a result, these authors have taken a more specified and focused approach in their reviews than Vial (2019). This is not to say that Vial's review (or approach) is superior. Yet, its breadth and level of abstraction in presenting prior research make it a keystone for subsequent DT studies to position themselves and their contribution beyond and across specific industries, business functions or research areas (e.g. Baiyere et al. 2020; Peter et al. 2020; Wessel et al. 2020). I have thus adopted his framework to structure prior literature informing my research.

In summary, this section has introduced the definition and framework of DT adopted in this treatise. Drawing on these two, it highlighted the three focal areas of concern in my research. Next, the following sections review the informing literature in these three areas of DT research.

2.2.2 Digital Transformation Strategy

The cornerstone of IS strategy research is the notion of strategic IT alignment (Henderson and Venkatraman 1993). Since Henderson and Venkatraman's seminal work, IS scholars have investigated different alignment paths between organisations' IT and business strategies with the goal of operationalising IT such that it best supports organisations' business strategies. Yet, with digital technologies altering organisations' value proposition, researchers started to rethink the role of IT in organisational strategy (Merali et al. 2012; el Sawy et al. 2010; Yoo et al. 2010). From this line of

thought emerged the concept of digital business strategy, i.e. an “organizational strategy formulated and executed by leveraging digital resources to create differential value” (Bharadwaj et al. 2013, p. 472). With their digital business strategy concept, Bharadwaj et al. (2013) suggested that the use of digital technologies demands to view business strategy and IT strategy not as two separate entities requiring alignment, but as one fused strategy. Adapting this view, scholars have investigated the role of digital technologies for organisations’ strategic responses to digital disruption (e.g. Karimi and Walter 2015; Sia et al. 2016; Yeow et al. 2018). Reviewing this work, Teubner and Stockhinger (2020) further suggested that the fusion of IT and business strategy risks blurs their distinction. They argued that “[b]oth strategies follow a logic of their own that, however, intersects and interrelates where IT is vital for value creation” (Teubner and Stockhinger 2020, p. 12). Regardless of whether conceived as fusing or intersecting, the conception of digital business strategy moves IT and digital technologies to the centre stage of organisational strategising (Bharadwaj et al. 2013; Merali et al. 2012; Teubner and Stockhinger 2020). Shifting from a business strategy to a digital business strategy, organisations formulate a DT strategy (Matt et al. 2015). They serve as blueprints, abstract notions for future organising, supporting “companies in governing the transformations that arise owing to the integration of digital technologies, as well as in their operations after a transformation” (Matt et al. 2015, p. 340). Table 2 provides an overview of the different IS strategy concepts.

Table 2. Overview and description of different concepts capturing the relation between business strategy and IS strategies

Strategy Concepts	Description
Business Strategy	Organisations’ central strategy which outlines their business goals and how they intend to accomplish these goals (Henderson and Venkatraman 1993; Merali et al. 2012).
IT Strategy	IT strategy as a separate organisational strategy which aligns the use of IT to the organisational goals outlined in the business strategy (Lederer and Salmela 1996; Salmela and Spil 2002; Teubner 2013).
Digital Business Strategy	Conceptual view which moves digital technology to the centre stage of strategising. While Bharadwaj et al. (2013) outlined the concept as fusing business and IT strategy, Teubner and Stockhinger (2020) found that both strategies should be kept separate for their own logic with the digital business strategy capturing their intersections.
DT Strategy	Focuses on the organisational changes which integration of digital technologies engender for organisations’ structure and value proposition (Chanias et al. 2019; Hess et al. 2016; Matt et al. 2015).

Prior research on DT strategy can be divided into two views. The first conceives DT strategy as an object and seeks to identify the core elements of such strategies, the underlying principles for future organising (e.g. Hess et al. 2016; Sebastian et al. 2017). Studies taking this view may link these principles to DT outcome (e.g. Sebastian et al. 2017). The second, following the practice turn in strategy research (Vaara and Whittington 2012), studies DT strategy making and its processual dynamics (e.g. Berghaus and Back 2017; Chanas et al. 2019). It is concerned with the micro-level foundations of strategising, i.e. how concrete practices of strategising enact DT strategy (Arvidsson and Holmström 2017). Yet, the lines between these views are not solid but dashed, i.e. they can be found within single studies (e.g. Matt et al. 2015). In the vein of the first stream, Matt et al. (2015) conceptualised a DT strategy framework comprising four dimensions. These are (1) use of digital technologies, (2) changes in value creation, (3) structural changes and (4) financial aspects (see Table 3). The authors argued that, to reap the intended effects of DT, these dimensions must be well aligned.

Table 3. Digital transformation strategy's four dimensions adapted from Matt et al. (2015)

DT Strategy Framework	Description
Use of Digital Technologies	Outlines the role of digital technology for an organisation's strategy and its attitude, ambition and ability to utilise digital technology to either become a market leader or operationalise business processes. While the first option holds the potential for competitive advantages, it also bears risks for lack of experience and capabilities.
Changes in Value Creation	Utilising digital technologies implies changes to organisational activities in the value creation process, value networks, products and services (i.e. value proposition). Accomplishing these changes requires new capabilities, adjustments in organisations' business scope but may provide opportunities for new revenue streams.
Structural Changes	Accommodating new value creation activities, structural changes may be required. These address the placement of the new activities in the corporate structure. Matt et al. (2015) proposed incorporating them into existing organisational structures or creating new ones, depending on the severity of changes.
Financial Aspects	Comprises available financial resources and the perceived urgency to act. While a diminishing bottom line may increase perceived urgency to act, it also implies constrained financial resources to invest. Conversely, an intact bottom line may reduce the perceived urgency to act. Financial aspects thus hold a dual role of being driver and limitation, and organisations should consider DT in a timely manner.

Concretising Matt et al.'s first and second dimensions, Sebastian et al. (2017) outlined two options for incumbent organisations' DT strategy. The first option, customer engagement, outlines a path which focuses on exploiting digital technologies (i.e. use of digital technologies) to improve customer experience. Companies choosing this path have focused on an omnichannel presence to provide an integrated customer experience (e.g. Hansen and Sia 2015). The second, digitised solutions, focuses on infusing digital technologies into existing services and physical products (i.e. use of digital technologies and changes in value creation). An exemplary case of an incumbent company focusing on the digitised solution strategy is Lego's, the famous Danish manufacturer of small brick toys, infusion of analogue toys with video games (Andersen and Ross 2016). Using digital technology, Lego changed its value creation from pure analogue manufacturing and selling of brick toys to also creating value through combinations of its analogue brick toys and video games (Andersen and Ross 2016). Sebastian et al. (2017) argued that the two options for a DT strategy will eventually converge regardless of which option an incumbent company chooses as its starting point. Yet, they proposed that it is best to choose and focus on one of these options to avoid spreading resources too thinly. This argument resonates with Matt et al.'s (2015) dimension of financial aspects (see Table 3).

Within the second stream, which focuses on DT strategy making, Arvidsson and Holmström (2017) proposed to study organisational actors' DT activities as strategising, that is, to study DT strategy not as an object but through organisational actors' activities that enact such strategy. Respective activities are, e.g. formulating or implementing strategy (Whittington 2006). Henfridsson and Lind (2014), studying IT strategy making, found that organisational sub-communities operationalise IT strategies. Sub-communities interpret and draw on their organisations' intended strategy developing emergent strategies. Chantias and Hess (2016) build on this notion of strategy emerging in organisational sub-communities by studying European car manufacturers' DT strategy making. They found that sub-communities' emergent strategies predominantly shaped the car manufacturers' realised DT strategies. They extended this notion to an in-depth interpretive case study of a financial service provider (Chantias et al. 2019).

Studying the financial service provider's DT strategy making, Chantias et al. (2019) concluded that DT strategies are different from IT strategies. While the latter focus on technology, DT strategies are business-centric and customer-oriented. They affect the entire organisation and, therefore, are developed by a multitude of different stakeholders. Given its involvement of multiple stakeholders, DT strategy making requires distinct governance structures, and as DT is a continuous process, DT strategies are continuously adjusted (Chantias et al. 2019). Their most significant finding, however, is the emergent character of DT strategy emphasising the importance of

informal aspects in DT strategy making. They found that DT strategy is not made in management back rooms but bottom-up at organisations' grassroots level.

Interested in the activities enacting DT strategy, Berghaus and Back (2017) studied multiple organisations' early phase DT. From this, they identified activities which they abstracted to five approaches of how organisations enact their DT strategy. Which approach an organisation takes, they concluded, depends on its situational context and that "managers tend to decide intuitively" (p. 14). Hence, their findings corroborate Chanias et al.'s (2019) argument that DT strategy making is subject to informal dynamics and decision-making. The following list outlines Berghaus and Back's (2017) five approaches:

- *Centralised approach*: DT strategy as an integral part of organisational strategy enacted by a typical strategy formation process comprising a gap analysis and subsequent charting of a roadmap.
- *Bottom-up approach*: At the grassroots level, multiple business units develop scattered DT initiatives engendering transparency and alignment pivotal challenges of this approach.
- *IT-centred approach*: Developing organisations' digital infrastructures to achieve digital readiness and facilitate digital innovation for more strategic and culturally-centred activities.
- *Innovation-centred approach*: Inventing innovative solutions to become a leader in innovation that establishes new industry standards and business models in saturated markets.
- *Channel-centred approach*: Building, extending and improving digital channels for closer and strengthened customer relations to better keep up with changing consumer behaviours.

In conclusion, researchers have studied DT strategy either as an object or a process of strategy making. Following the first view, they have been concerned with identifying the cornerstones of DT strategy as well as what makes "good" DT strategy. In the second view, they have found that these strategies tend to emerge from the bottom-up, and thus scholars studying DT strategy making need to account for the micro-dynamics and informalities of this process. Both views share, however, that DT strategy deals with the changes which organisations implement for their DT.

2.2.3 Digital Transformation as Organisational Change

Research on IT and organisational change (or IT-enabled change) has a long tradition in IS (Barley 1986; Besson and Rowe 2012; Orlikowski and Robey 1991). In 1988, Markus and Robey published their seminal paper on IT and organisational change,

distinguishing between a technology and an organisational imperative for such changes as well as offering an emergent perspective. Later, in 2004, Markus then introduced the notion of technochange, i.e. the purposeful introduction of an IS to trigger organisational changes for performance improvements. In her conceptualisation, technochange is based on an IT in conjunction with organisational changes, whereas organisational change programmes focus on people and an IT project on new IT. Further, Besson and Rowe (2012) conducted a review on IT-enabled organisational change and identified four themes structuring research on this phenomenon: organisational inertia, process, agency and performance. Considering Vial's (2019) definition of DT as a process in which an entity (i.e. agency) aims to improve its performance using a combination of technologies (i.e. technochange), we can observe that the concepts of IT-enabled change may also apply to DT. This poses the question of whether DT is conceptually different from IT-enabled organisational change.

On this matter, Wessel et al. (2020) have provided an empirical analysis of the difference between the phenomenon of DT and IT-enabled change. Their research thus contributes to a significant academic debate on whether DT is distinct from what researchers have conceived of as IT-enabled change and, hence, warrants its own conceptualisation (cf. Baiyere et al. 2017, 2019). Wessel et al. (2020) concluded that DT is a deep structure change that results in a qualitatively different organisation in terms of identity and value proposition. That is, DT (re)defines a company's value proposition entailing emergence of a new organisational identity. Compared with this, in IT-enabled organisational change, companies utilise technology to support their value propositions reinforcing their organisational identity. In addition, as Lucas and Goh's (2009) study of Kodak revealed, identity affects how organisational actors conceive of technology (cf. Tripsas 2009).

Studying identity change, Utesheva et al. (2016) investigated an Australian news agency. They found that managers, employees and customers' (i.e. consumers of news) roles and identity shift in the dissemination of news as the agency introduces digital technologies. In line with Wessel et al.'s (2020) argument, the introduction of digital technologies to the production of news redefined the news agency's value offering. As a consequence of this redefinition, the identity and role of both producers and consumers of news evolved. Utesheva et al.'s study shows how entire job roles become obsolete (e.g. role of the print formatter) or how consumers' identity and role evolve into co-creators of news. The authors deduced that renegotiation of identity is required for successful DT (Utesheva et al. 2016).

While Utesheva et al. (2016) focused on the concept of identity change in an organisation's DT, Svahn et al. (2017) delved into the process of a car manufacturer – Volvo – redefining its value proposition. Prior digital innovation research had identified four competing concerns (e.g. Henfridsson and Lind 2014; Lucas and Goh

2009; Tripsas 2009; for a full list see Svahn et al. 2017). Svahn et al. (2017) synthesised these concerns and illustrated their interrelation and differences as Volvo redefined its value proposition. Volvo envisioned connecting its cars to offering customers digital services beyond the point of sale. The authors described Volvo's journey toward this vision and how the company's managers faced and managed all four competing concerns. They found that the concerns emerged interrelatedly and not specific to any episode in Volvo's journey. Thus, Svahn et al. provided insights into Volvo's "emergent tuning process of accommodation and resistance" (2017, p. 270) as the firm redefined its value proposition. Accommodation refers to how the managers embraced opportunities that digital technologies offer (Lucas and Goh 2009; Tripsas 2009), while resistance surfaced because of reflecting shifts in Volvo's identity and culture (Svahn et al. 2017).

Resistance and challenges are a prime theme in research on organisational changes for DT (Piccinini et al. 2015; Schwarzmüller et al. 2018; Vogelsang et al. 2019). After all, it is inertia and the forces that enact it that make the phenomenon of change a theoretically and practically pivotal topic for IS research (Besson and Rowe 2012). DT requires organisations to alter and change entrenched practices to redesign their organising for DT (Majchrzak et al. 2016). In this redesign process, they face managerial and coordination challenges (Piccinini et al. 2015; Vogelsang et al. 2019) as well as challenges regarding employees' skills, role and leadership (Colbert et al. 2016; Schwarzmüller et al. 2018). To address the first, scholars have found, organisations introduced the new role of the CDO (Horlacher and Hess 2016; Singh and Hess 2017; Tumbas et al. 2018) or different types of digital innovation units (Fuchs et al. 2019; Leonhardt et al. 2018). They roll out organisation-wide change programmes addressing their organisational culture, employees' roles and their skills as well as leadership (Duerr et al. 2018; Fuchs and Hess 2018). Partly, prior research has conceptualised the latter as transforming organisations' workplaces into digital workplaces (Gimpel et al. 2018; Kane 2015; White 2012).

Dery et al. defined the concept of digital workplace as "the physical, cultural and digital arrangements that simplify working life in complex, dynamic and often unstructured working environments" (2017, p. 136). In their study, they identified two dimensions of a digital workplace: (1) responsive leadership and (2) employee connectedness. They defined the first as a leadership style in which managers focus on developing and improving employees' experience in their organisation and the second as employees' opportunities and possibilities to connect and engage with each other and crucial stakeholders to exchange information and ideas. Similarly, Köffer (2015) found that existing research into the concept of digital workplace investigated topics such as collaboration, mobility, compliance and technostress. He concluded that organisations should encourage the use of digital technologies for collaboration purposes. Corroborating Köffer's themes, Colbert et al. (2016) argued for mindful

use of technology in the digital workplace. Beyond technology use, they claimed, the digital workplace brings challenges for employees' skills, roles and leadership (cf. Meske 2019; Schwarzmüller et al. 2018).

In summary, research on DT has built on the tradition of IT-enabled organisational change (Vial 2019; Wessel et al. 2020). This is reflected in scholars' strategy perspective when studying organisations' DT. Wessel et al. (2020) ground this perspective in early IS research (e.g. Henderson and Venkatraman 1993). They found, however, that DT is conceptually different from IT-enabled organisational change in that it redefines organisations' value proposition, entailing emergence of a new organisational identity while IT-enabled organisational change supports organisations' value proposition, thus reinforcing their identity (Wessel et al. 2020). Hence, DT research into organisational changes can be divided into research focusing on redefinition of organisations' value proposition (e.g. Bharadwaj et al. 2013; Porter and Heppelmann 2014; Svahn et al. 2017) or changes to their culture and identity (e.g. Fuchs and Hess 2018; Tripsas 2009; Utesheva et al. 2016).

2.2.4 Digital Technology: Driver of Digital Transformation

Digital technologies are central to our notion of DT. In fact, Vial (2019) has placed them at the start and centre of his DT process framework (see Figure 4): at the start because scholars view them as fuelling digital disruption of products, the competitive landscape and the labour market (Colbert et al. 2016; Karimi and Walter 2015; Loebbecke and Picot 2015) and at the centre for organisations rely on them to redefine their value proposition (Matt et al. 2015; Svahn et al. 2017; Utesheva et al. 2016). Thus, prior research has positioned digital technologies at the centre stage of DT (Bharadwaj et al. 2013; Wessel et al. 2020; Yoo et al. 2012) as the artefact driving DT. Yet, what makes digital technologies special?

Conceptualising how digital technologies alter products and services, Yoo et al. (2010) outlined a layered modular architecture. It separates devices from services due to digital technologies' reprogrammability, and network from content for the homogenisation of data. While reprogrammability allows organisations, e.g. to deliver navigation and medical services – two rather distinct service domains – via the same device, homogenisation of data permits them, e.g. to provide news as text with illustrations, as a podcast or a vlog through the same network. The resulting loose couplings across the four layers – devices, networks, services and contents – conceptually explains why “digital technologies are more than just bits and bytes, this digital infrastructure consists of institutions, practices, and protocols that together organise and deliver the increasing power of digital technology to business and society” (Hagel et al. 2011, p. 4). Yoo et al. (2010) concluded that digital technologies

and, in particular, the modularity they afford, challenge the hitherto entrenched assumptions of product architectures and organising.

Kallinikos et al. (2013) outlined four attributes of digital technologies which provide for this modularity. Their point of departure is to study digital technologies as incomplete objects that transcend the physicality of the devices bearing these objects; a notion which was also evident in Yoo et al. (2010). In the following list, I present Kallinikos et al.'s four attributes of digital technologies understood as objects:

- *Editable*: Digital objects are malleable and can always be, in principle, updated or edited rearranging the items that constitute them.
- *Interactive*: Human (and non-human) agents can interact with digital objects for exploring and connecting information or activating embedded functions. Unlike editing, interaction does not alter digital objects.
- *Open and reprogrammable*: Digital objects are open, accessible and reprogrammable through other digital objects. Editing a software (a digital object itself) used to open a digital object can reprogram the latter.
- *Distributed*: Digital technologies' openness and resulting interoperability spreads them fluidly across institutional boundaries. They are thus seldom contained, governed and managed within (or by) a single entity.

The authors concluded that these attributes provide for the modularity that digital technologies afford, but also render them incomplete. That is, digital technologies are always being edited, reprogrammed and interacted with by a distributed network of agents. Due to this incompleteness, digital technologies shake and disrupt organising and social orders that have predominantly been built on the stability of traditional physical objects (Kallinikos et al. 2013; Yoo et al. 2010). This notion was further extended into an ontological reversal in Baskerville et al. (2020). This reversal goes from reflecting to creating reality. Accordingly, organisations previously employed IT to accurately reflect physical reality to inform and, thus, to improve decision-making. In this view, researchers and practitioners conceived of IT as stable, containing information reflecting reality which it has to reliably reproduce. With the ontological reversal, "information exceeds virtuality and takes us instead to material and physical reality" (Baskerville et al. 2020, p. 7). For example, digital flight tickets precede their physical printouts on paper or a smartphone screen. With a flight running late, the ticket system computes updates for subsequent connections and related digital tickets. These updates then take precedence in validity over former ticket printouts; the physical ticket hence reflects the digital. Without a digital ticket, of which their printout is a hard copy, passengers have no right to travel. It is thus the digital technology that creates reality, not the physical.

A common theme in these conceptual articles is that, in theorising digital technology, the authors draw on digital ecologies, ecosystems or platforms rather than single digital technologies. This is an observation Vial (2019) also makes in his review of DT studies. He found that scholars investigating organisations' DT focus on multiple, distributed digital technologies rather than, as in IT-enabled change, on bounded, large-scale information system (e.g. an enterprise resource planning (ERP) or customer relationship management (CRM) system) (cf. Vial 2019). This is reflected in his definition of DT referring to "combinations of information, computing, communication, and connectivity technologies" (2019, p. 122). In these combinations, besides moving toward digital technologies that are social, mobile or in the cloud, organisations aim at building service ecologies, i.e. interoperable and open as well as distributed digital platforms (Constantinides et al. 2018; Fürstenau, Rothe, et al. 2019). From an economic viewpoint, digital platforms are virtual markets allowing participants to exchange (or trade) (Fürstenau, Rothe, et al. 2019). Yet, Constantinides et al. conceptualised "digital platforms as a set of digital resources – including services and content – that enable value-creating interactions between external producers and consumers" (2018, p. 381). As such, digital platforms alter the organising logic in general, and for digital innovation in particular (Fürstenau, Rothe, et al. 2019; Yoo et al. 2010, 2012).

In their special issue editorial on digital platforms and infrastructures, Constantinides et al. (2018) noted a move toward infrastructurisation. By this, they refer to organisations tending to develop digital infrastructures which underlie their digital platforms. While the concept of digital platforms focuses on the development and orchestration of services and contents, digital infrastructures are combinations of digital technologies that, unlike specific systems or applications, have neither a distinct set of functions nor strict boundaries (Tilson et al. 2010). Hence, platforms connect actors along the value chain on the basis of the combination of computing, communication and connectivity technology as well as data that digital infrastructures form (Constantinides et al. 2018; Tilson et al. 2010). This combination of technologies renders organisations functional. Put differently, organisations' digital infrastructures are the fabric that interweaves their organising (Zammuto et al. 2007). Engaging in their DT, organisations thus reconfigure their digital infrastructures to redefine their value propositions and operational processes.

Here, I will highlight prior literature's key arguments. Firstly, digital technologies' attributes afford a modularity that separates formerly glued layers of product architecture. This layered modularity of devices, network, services and content challenges our assumptions of organising. Secondly, while digital technologies, such as IT, can reflect physical reality, their transformative power lies in their potential and application to precede and create physical reality. The proliferation of data through digital technologies puts aside information scarcity in decision-making and creates

the opportunity to compute outcomes that precede their physical form (Baskerville et al. 2020). Thirdly, prior research has ascribed the phenomenon of organisational DT not to a single digital technology but to combinations of them. It has studied these combinations through concepts such as ecosystems, platforms and digital infrastructures. Assembled, these key arguments put forth that digital technologies obtain a central role in organisations' DT process; they are the artefact underlying DT (Orlikowski and Iacono 2001). To understand their role in organisations' DT, we therefore need to study how combinations of digital technologies interweave with organising (and vice versa).

2.3 Selected Theoretical Angles to Study Digital Transformation

IS researchers seek to analyse, describe and explain the how and why of phenomena involving IS or even predict how or what future instances may emerge (Gregor 2006; Mueller and Urbach 2017; Sidorova et al. 2008). Theories, “systems of concepts and interrelationships among them” (Mueller and Urbach 2017, p. 350), take a pivotal role within this research endeavour. Theory may represent agreement amongst scholars as to which concepts are apt to describe and explain a certain phenomenon (Mueller and Urbach 2017). Theory may follow a variance or a process model (Markus and Robey 1988). It may act as a sensitising device moving certain aspects to the foreground while delegating others to the background (Walsham 2006). While one theory may only serve to describe or explain but not to predict, another theory may well both explain and predict a phenomenon or even facilitate solution design for an IS-related problem (Gregor 2006). This general take on the role of theory in IS holds true also for DT research. Thus, this chapter presents my criteria for selecting this treatise's theoretical angles before reviewing prior work constituting the respective theories.

2.3.1 Criteria for Selecting the Theoretical Angles

On the quest to unpack DT, researchers have employed different theories. They have drawn on the resource-based view, especially dynamic capabilities (e.g. Yeow et al. 2018), on disruptive innovation (e.g. Karimi and Walter 2015), on strategy-as-practice (e.g. Chanias et al. 2019) or on the activity-based view (e.g. Berghaus and Back 2017). This list could be continued at length, which brings me to the pivotal point: the choice of theory depends on the area of concern studied within DT. Hence, there is not just a single theory apt to study DT but an array of theories with each embellishing a different facet of the phenomenon. Considering my research purpose and focal areas of concern, I will be drawing on multiple theoretical angles to analyse

and explain the interplay between macro- and micro-level activities co-enacting DT. These theoretical angles are improvisation theory, institutional theory and digital infrastructures. I have selected these angles based on two considerations:

- *Fit to area of concern:* The suitability of a theory and its concepts to study the areas of concern my dissertation addresses.
- *Macro- and micro-level perspective:* The ability and adequacy of a theory and its concepts for analysing and explaining the macro and micro levels of organisations' DT.

Table 4 provides an overview of the selected theoretical angles and outlines my reasoning for selecting these theories to address the two considerations above. The subsequent sections then introduce these theories outlining their key notions and the concepts which I employed in my research.

Table 4. Overview of and reasoning for the theories selected for this treatise's research

	Improvisation Theory	Institutional Theory	Digital Infrastructure
Key Notion	"[...] the conception of action as it unfolds, by an organization and/or its members, drawing on available material, cognitive, affective and social resources" (Cunha et al. 1999, p. 303).	Institutions as established social orders that represent socially constructed rules of the game (Greenwood et al. 2008; Mignérat and Rivard 2009; Scott 2001).	Conceives combinations of digital technologies as one digital artefact; an ecology of material and social dimensions which render organisations functional (Tilson et al. 2010).
Employed Concepts	Minimal structure	Institutional logics, deinstitutionalisation	Infrastructure evolution
Area of Concern	DT strategy making	Organisational change	Digital technology
Fit to Area of Concern	Improvisation theory's key notion of planning unfolding in action makes it an apt lens through which to analyse and explain intuitive decision-making. Prior studies found that DT strategising is often based on intuitive and situational decisions (Berghaus and Back 2017; Chanias et al. 2019).	Institutional theory provides an array of concepts to analyse and explain phenomena of organisational change (Greenwood and Hinings 1996) and DT in particular (Hinings et al. 2018). Prior studies on DT have demonstrated its fit to this area of concern (e.g. Tumbas et al. 2015, 2018).	Digital infrastructure provides a useful theoretical angle to study the combinations of digital technology underlying DT (Tilson et al. 2010; Yoo et al. 2010). Prior studies have insightfully employed this theoretical angle to study issues of digital technologies in the context of DT (Fürstenau, Baiyere, et al. 2019; Grisot et al. 2014).
Macro- and Micro-level Perspective	Improvisation theory has been employed to study decision-making at the individual, group and organisational level (Hadida et al. 2015). Thus, the theory offers concepts (e.g. minimal structure) explaining how improvisational activities at the micro level connect with decisions and improvising at the macro-level of organisations (Cunha et al. 1999; Hadida et al. 2015).	Early institutional theory focused on macro-level phenomena (DiMaggio and Powell 1983; Meyer and Rowan 1977). Later studies entailed development of concepts focusing on the micro foundations that constitute the macro level of institutions (Friedland and Alford 1991; Oliver 1992). Thus, the theory provides concepts for the study of organisational phenomena at the macro and micro levels.	Digital infrastructure evolution is subject to both macro- and micro-level dynamics. These dynamics, in particular how they may play out, are therefore captured in the concepts which researchers employ to analyse and explain digital infrastructure evolution, e.g. generativity (Henfridsson and Bygstad 2013), drift (Ciborra 2000) or the paradoxes of change and control (Tilson et al. 2010).

2.3.2 Organisational Improvisation as Crafting Strategy

Organisational improvisation, as a theory, emerged in the 1990s. In the twentieth century, organisational and management theory focused on reducing uncertainty by planning and establishing routines (Vera and Crossan 2004; Weick 1998). In contrast, researchers and practitioners understood improvising as diverting from routines and acting extemporaneously, i.e. without planning. Moreover, they saw improvising as the antithesis to their cause of reducing uncertainty through better routines and planning (Vera and Crossan 2004). Yet, in 1989, Weick, drawing on jazz as a metaphor, illustrated the prevalence of improvising in organisations. In the subsequent decade, organisational researchers engaged in Weick's notion and built the groundwork for the theory of organisational improvisation (Cunha et al. 1999; Hadida et al. 2015). Drawing on the metaphor of jazz music (and other arts and practices connotated with improvisation; see, e.g. Crossan 1998; Kamoche et al. 2003; Mirvis 1998), they postulated that organisations – or organising – is often performed by actors improvising, rather than adhering to rules and structures, to achieve an organisational goal (Weick 1989, 1998). Whenever actors face a breakdown (e.g. non-applicability of a norm, rule, defined process or an unplanned event), they improvise to resolve it (da Cunha et al. 2003). Therefore, researchers in organisational studies started to conceive of improvising not as an opposite to organising but an endemic part of it (Orlikowski 1996). However, what is organisational improvisation?

Scholars compiled various definitions to capture what improvisation is (Cunha et al. 1999; Hadida et al. 2015). Crossan explained that, in improvisation, “action is taken in a spontaneous and intuitive fashion” (Crossan 1998, p. 593) and Mirvis described improvisers as people who “make it [planning] up as they go along” (1998, p. 587). Moorman and Miner stated that they “define improvisation as the degree to which composition and execution converge in time” (1998a, p. 698). Later, Miner et al. refined this definition to “improvisation is the deliberate and substantive fusion of the design and execution of a novel production” (2001, p. 314). Cunha et al. (1999), synthesising existing definitions, analysed organisational improvisation by inspecting its terms separately. According to them, improvisation is *organisational* if performed by an organisation (or its actors). The practice of *improvising* is an intentional effort best captured as “the conception of action as it unfolds, drawing on available material, cognitive, affective and social resources” (1999, p. 302). Specifying who performs organisational improvisation, Hadida et al. (2015) classified existing research as studying improvisation on an individual, group or organisational level. Across these definitions, we can find that organisational improvisation is deliberate action (Cunha et al. 1999; Hadida et al. 2015; Miner et al. 2001) characterised by a convergence of time between planning and execution (acting extemporaneously or on the spur of the moment) (Ciborra 1999; Moorman and Miner 1998b;

Weick 1998) and bricolage (making do with whatever resources are available) (Cunha et al. 1999; Miner et al. 2001).

Investigating organisational improvisation theory, researchers have studied the conditions under which it occurs (e.g. Cunha et al. 1999), its outcomes (Moorman and Miner 1998a; Vera and Crossan 2005) and factors for good improvisation (e.g. Bernstein and Barrett 2011; da Cunha et al. 2003). In an extensive review of the work on improvisation published in the 1990s, Cunha et al. (1999) subsumed a set of three conditions under which improvisation occurs. Firstly, organisations (or their actors) improvise if they perceive an *urgency to act* and can neither plan nor postpone their action. Secondly, when their action is based on *constrained resources*, as a result, they have to make do with whatever is at hand (i.e. bricolage; Cunha et al. 1999). Lastly, when they face an *unprecedented situation* for which they have no pre-made script or plan, they are required to improvise. All three of these conditions are necessary antecedents for organisations (or their actors) to improvise. That is, bricolage itself does not entail improvisation if actors have a ready-made plan or time to craft a plan (or time to wait for optimal resources, i.e. no urgency to act). Similarly, during a planned for emergency (e.g. loss in cabin pressure during a flight), actors perceive urgency to act but have pre-made plans to follow, and thus, they do not improvise (if the emergency was unprepared for, actors may well improvise; see, e.g. Mendonça 2007; Weick 1993). Hence, organisational improvisation occurs when all three conditions coincide.

Studying its outcomes, scholars found that improvisation produces different types of outcomes (i.e. behavioural, artefactual or interpretive) (Cunha et al. 1999; Miner et al. 2001). While, in the 1990s, two strong poles were predominant – improvisation delivers novelty vs. improvisation equals chaos (Cunha et al. 1999), Vera and Crossan (2004, 2005) found that it can have both positive (e.g. flexibility, learning and motivation) and negative (e.g. biased learning, opportunity traps and amplification of emergent actions) outcomes. They concluded that improvisation is thus neither intrinsically positive nor negative. Along this line, Cunha et al. (2014) claimed that improvisation is a situated practice. Accordingly, the evaluation of improvisation and its outcome depends on its situated practice (i.e. context). Contexts in which scholars have argued that organisational improvisation produces positive outcomes are the creation and design of new products, innovations or processes. In particular, this happens if organisations face an unanticipated and increasingly turbulent business environment (Hadida et al. 2015; Kamoche and Cunha 2001; Moorman and Miner 1998b). Moreover, organisational scholars investigated improvisation as a type of learning (Cunha and Clegg 2019; Miner et al. 2001; Moorman and Miner 1998a). As a form of learning, organisational improvisation can reproduce the status quo (i.e. convergent improvisation) or question the status quo entailing the enactment of new routines (i.e. divergent improvisation) (Cunha and Clegg 2019).

In this vein, scholars have also employed the theory in studies of organisational change (e.g. Cunha and da Cunha 2003; Orlikowski 1996; Smets et al. 2012). Assuming that improvisation is a skill that can be trained (Crossan 1998; Vera and Crossan 2005), scholars investigated which factors positively influence organisational improvisation.

To identify factors for good improvisation, researchers studied jazz bands (Bernstein and Barrett 2011; Weick 1998), improvisational theatre (Crossan 1998; Vera and Crossan 2004) and other art performances (Kamoche et al. 2003). Viewing these as metaphors, they sought to reveal what underlies musicians, actors or other artists' performance of improvisation. They identified a set of factors comprising an experimental culture, organisational memory and a minimal structure (Cunha et al. 1999). Improvisation is a creative practice in which organisational actors engage without foreseeing every possible contingency of their actions nor knowing whether they will achieve success. Hence, failure and (in hindsight) wrong decisions are part of the art. Scholars have thus argued that an experimental culture in which organisational actors feel safe to engage in creative tasks and to speak openly about failures is a key success factor for improvisation (Barrett et al. 2018; Cunha et al. 1999; Magni et al. 2009). It involves a style of leadership which grants autonomy, listens, allows turn-taking and promotes learning from failure (Bernstein and Barrett 2011; Crossan 1998). The latter is especially important as it not only nurtures improvisation but also builds organisational memory (Miner et al. 2001).

Organisational memory and improvisation have a two-way relationship (Moorman and Miner 1998a). As mentioned above, improvisation is a type of learning and, as such, can construct organisational memory. Simultaneously, organisational memory can also facilitate improvisation (Cunha and Clegg 2019; Miner et al. 2001). Distinguishing between procedural (how things are done) and declarative memory (how things function), Moorman and Miner (1998a) found that the first can increase speed but reduce novelty, while the latter can increase novelty but reduce speed. Another aspect of organisational memory is its accessibility. Since actors improvise on the spur of the moment, they draw on the available information. Good information flow is thus crucial for improvisation (Magni et al. 2009; Moorman and Miner 1998b). Yet, as Moorman and Miner (1998a) found, it can also slow the process as actors need to assess and select the best accessible information. Another problematic aspect of memory is actors reproducing previously observed structures or outcomes. This may consequently constrain their creativity and flexibility (da Cunha et al. 2003; Cunha and Clegg 2019). Therefore, prior research has suggested that organisations need to find a balance between procedural and declarative memory.

Contrary to widespread belief, improvisation is not without structure but, in fact, benefits from a minimal structure (da Cunha et al. 2003). In jazz, this structure can be tonality, a melody or rhythm guiding players joint improvisation (Barrett 2012;

Weick 1998). In organisations, it can be a slogan, a vision or a (sequence of) deadline (Kamoche and Cunha 2001). In the form of a deadline, a minimal structure can also create and maintain an urgency to act (Cunha et al. 1999). Yet, a too constraining structure can stall improvisations' occurrence. In fact, structure and improvisation have a curvilinear relationship (da Cunha et al. 2003). Both low and high levels of structure negatively affect improvisation. A minimal structure, however, frames the meaning of an improvisational act and offers guidance while permitting flexibility, two features which positively affect improvisation (da Cunha et al. 2003; Kamoche and Cunha 2001). Conceptualising a model for new product development, Kamoche and Cunha (2001) differentiated between social and technical elements of structure. The social elements comprise, e.g. objectives, priorities and communication. The technical elements consist of, e.g. quality standards, project, product or process templates and procedural and declarative memory. Jointly, these elements constitute the concept of minimal structure in organisational improvisation theory.

The groundwork for organisational improvisation theory lies in the discipline of organisational research. Yet, IS scholars have adopted the theory to understand IS phenomena or to advance the theory and its concepts. Amongst the first, Orlikowski (1996) investigated IT and organisational change situating the latter in actors' local practices to which improvisation is endemic. She argued that change emerges from these practices making it the rule rather than an exception. Similarly, Ciborra (1996) claimed that, if improvisation is endemic to organising, software development must shift its focus from designing ISs that support planned decision-making to ISs that support actors' improvisation. Building on her earlier work, Orlikowski and Hofman (1997) constructed an improvisational model for organisational change which conceptualised change as a sequence of planned, emergent and opportunity-based change. They cautioned, however, that their model might be restricted to its empirical grounding in a global and networked organisation. Macredie and Sandom (1999) addressed this limitation extending Orlikowski and Hofman's model to a traditional and hierarchical organisation. They concluded that improvisational change also occurs in this setting but covertly. At an intersection of IT, organisational change and software development, McGann and Lyytinen (2008) studied IS evolution through the lens of improvisation. Their findings and theorising explained how users' local improvisations in system use can entail large-scale change and, thus, IS evolution. In line with Moorman and Miner (1998a) and da Cunha et al. (2003), Molnar et al. (2017) found that, early on in the software development process, improvisation is fluid, thus constraining its production of innovative solutions. In later stages, however, the increasing structure confines improvisation's fluidity but propels its innovativeness. Other IS scholars studying software development have drawn on improvisation theory to develop the concept of agility (Cornford et al. 2007; Tan et al. 2010; Zheng et al. 2011).

In the context of DT and dynamic markets, Du et al. (2018) provided insights into how Tencent, utilising improvisation, identified opportunities and threats to then produced creative responses. In this vein, Xiang et al. (2020) found that organisational improvisation can help organisations to identify and seize opportunities. Pavlou and El Sawy already put forth this notion in 2010, developing the concept of improvisational capabilities. Contrasting it against dynamic capabilities, they argued that, while both are reconfiguration capabilities, the first comes into play when responding to unanticipated events, while the second handles anticipated and planned for changes. Studying these capabilities, they found that improvisational capabilities are more effective than dynamic capabilities in highly turbulent environments. Accordingly, organisations should develop the two as complementary to keep their competitive edge (Pavlou and el Sawy 2010; el Sawy et al. 2010). Drawing on this notion, Levallet and Chan (2015, 2018) studied how digital capabilities can support improvisation at a level of strategic decision-making. They identified a flexible IT infrastructure and good information management capabilities as necessary but not sufficient conditions. Other important factors are, e.g. an experimental culture.

In conclusion, organisational improvisation is a situated practice which can yield positive outcomes especially in product development, innovation and strategy making. This is particularly the case in highly turbulent and unanticipated situations (Hadida et al. 2015). In IS research, scholars have studied improvisation in the software development process (Du et al. 2018; Magni et al. 2006; Zheng et al. 2011), as a source for organisational change (Macredie and Sandom 1999; McGann and Lyytinen 2008; Orlikowski 1996), and as a third type of capability that can complement dynamic capabilities (Pavlou and el Sawy 2010; el Sawy et al. 2010). In this context, IS scholars have investigated how IS can support organisations' improvisational capabilities and the practice of strategic improvisation (Levallet and Chan 2018). While this provides us with an understanding of the benefit of improvisation on a macro level, we know little about its link to or enactment at the micro level of DT strategy making. Yet, organisational improvisation offers an adequate lens for these kinds of activities, and, in particular, the concept of minimal structure provides interesting avenues for linking emergent micro-level activities to macro-level activities (see Table 5) (Hadida et al. 2015; Orlikowski 1996).

Table 5. The key concepts of organisational improvisation in this treatise

Concepts	Description	Literature
Improvisation	Improvisation is an intentional organisational practice. It can occur at the individual, group and organisational levels. Improvising, actors act on the spur of the moment. That is, planning and execution converge in time, while actors draw on the available resources (i.e. bricolage).	(Ciborra 1996; Crossan 1998; Cunha et al. 1999; Hadida et al. 2015; Miner et al. 2001; Weick 1998)
Minimal Structure	A minimal structure frames the meaning of an improvisational act and offers guidance while permitting flexibility. Structure and improvisation, however, have a curvilinear relationship. Both low and high levels of structure negatively affect improvisation. Thus, minimal structuring can facilitate deliberate organisational improvisation.	(Barrett 2012; Barrett et al. 2018; da Cunha et al. 2003; Hadida et al. 2015; Kamoche and Cunha 2001; Vera and Crossan 2004)

2.3.3 Organisational Institutionalism and Change

Organisational institutionalism is the application of institutional theory in the study of organisational phenomena (Greenwood et al. 2008). It investigates and captures how organisations attach and ascribe meaning to certain elements (and not others) in an institutional environment (Suddaby 2010). In this vein, it seeks to foreground why organisations ascribe meanings against any rationality in the economic or traditional sense of the term “rational” (Greenwood et al. 2008; Meyer and Rowan 1977). That is, it treats organisations, organisational actors and their activities not as at all times economically rational but also irrational. The core concept in these investigations involves institutions. Institutions are socially constructed, established orders with taken for granted and repetitive practices, actions, facts and shared understandings. They “provide stability and meaning to social life” (Scott 2001, p. 48) and constitute multiple levels, i.e. group, organisational, field or societal levels (Greenwood et al. 2008). While organisations can form institutions, organisations are also part of an organisational field, i.e. a set of “organisations that, in the aggregate, constitute a recognized area of institutional life” (DiMaggio and Powell 1983, p. 148). Thence, organisational institutionalism studies how institutions become (and change). It analyses and explains institutional processes and effect both on a field level and an intra-organisational level (i.e. within a single organisation) through concepts such as isomorphism (Boxenbaum and Jonsson 2008; DiMaggio and Powell 1983), institutionalisation or deinstitutionalisation (Greenwood and Hinings 1996; Oliver 1992; Zucker 1977) and institutional logics (Friedland and Alford 1991; Greenwood et al. 2011; Thornton and Ocasio 2008).

Since the inception of “new” organisational institutionalism in the late 1970s and early 1980s (e.g. DiMaggio and Powell 1983; Meyer and Rowan 1977; Zucker 1977), organisational scholars have foregrounded different aspects of institutional processes and effects in organisations (Greenwood et al. 2008; Suddaby 2010). Early studies and concepts focused on the diffusion of institutional norms (Greenwood et al. 2008). Meyer and Rowan (1977), e.g. finding that norms may not diffuse and institutionalise for their economic efficiency, but organisations may adapt them for their acceptance in a field or society. Thus, an organisational field may rationalise certain ideas, beliefs, values, rules or norms not for producing economically desirable outcomes but for being perceived as legitimate and consequently ensuring organisations survival. They conceptualise this phenomenon as “rationalised myths.” Once these myths are institutionalised, they transmit to and prevail over generations without monitoring or enforcement (Zucker 1977). Moreover, Zucker’s findings illustrate that actions which are objective (i.e. other actors can repeat them without changing their meaning) and exterior (i.e. intersubjective definition of actions, thus becoming part of external reality) reach high institutionalisation and, therefore, feature a strong resistance to change. DiMaggio and Powell (1983) then studied how such “rationalised myths” diffuse in an organisational field. They conceptualised three mechanisms: (1) coercive (diffusion by pressure from other organisations on which one depends), (2) mimetic (diffusion by imitating other organisations) and (3) normative (diffusion by professionalism). They concluded that these mechanisms entail isomorphism, i.e. organisations of the same field tend to assimilate and become alike in their structures. While these early studies established organisational institutionalism, scholars criticised that they emphasised diffusion of institutional norms over their content and depict organisations as passive recipients of institutional pressures (Friedland and Alford 1991; Kondra and Hinings 1998; Oliver 1991).

Recollecting institutionalism in the 1990s, organisational scholars shifted their focus to study institutions’ content and organisations as well as actors’ agency in institutional processes (Greenwood et al. 2008; Kondra and Hinings 1998; Suddaby 2010). In this vein, Friedland and Alford (1991) conceptualised institutions’ content as institutional logics. Conceiving society as constituted by multiple institutions which form an inter-institutional system, they argued that actors draw on multiple institutions’ logics that form the context and meaning of their action. Accordingly, they noted, “individual action can only be explained in a societal context, but that context can only be understood through individual consciousness and behaviour” (p. 242). Conversely, individual action constitutes institutions and their logics and, thus, the context which gives meaning to this individual action. Friedland and Alford suggested that actors may purposefully draw on a logic from a different institution to induce change in an organisation or its field logic. For example, to promote work life balance, employees may draw on the family logic in the institutional context of their

workplace. Scholars study this notion of actors combining and repurposing logics to disrupt and change institutional arrangements as institutional entrepreneurship (Tracey et al. 2011).

Another concept introduced in the 1990s was deinstitutionalisation. In her seminal paper, Oliver (1992) challenged the view that institutionalised practices persist. If persistence of institutionalised actions was the rule, she argued, why do we observe organisational change? She conceptualised antecedents that predict deinstitutionalisation. While prior literature focused on exogenous pressures, she identified ten organisational factors and eight external ones placing agency for deinstitutionalisation also with and within organisations. Similarly, Kondra and Hinings (1998) challenged prevailing views of isomorphism. Asking why organisations, despite isomorphic mechanisms, produce differing performance outcomes. Answering this question, they conceptualised a two-dimensional framework comprising organisational performance and institutional fit. They found that renegade organisations (excelling performance/low institutional fit) possess agency to change institutions. For instance, other organisations may mimic renegades for their excelling performance, entailing shifts in organisational structure as more organisations adopt the renegade's institutional norms. However, institutional operators (normal performance/high institutional fit) may also raise coercive pressures against renegades. Their framework thus illustrates organisations as active players in their institutional context and not as passive reactants to institutional pressures.

This recap of organisational institutionalism describes only a small fragment of the theory's concepts. Others than the ones mentioned are, e.g. institutional work (Hampel et al. 2017; Lawrence and Suddaby 2006), embedded agency (Battilana 2006; Battilana and D'Aunno 2009) and translation (Wæraas and Nielsen 2016). Organisational scholars have regarded this supple supply of conceptual devices as the theory's strength but also its risk (Greenwood et al. 2008; Munir 2019; Suddaby 2010). With this treatise's second area of concern being organisational changes in DT, I draw on the concepts of institutional logics and deinstitutionalisation for their ability to explain change from an institutional perspective.

Institutional logics capture institutions' belief systems: the material practices and symbolic constructions that constitute an institution's organising principles available for actors to elaborate (Friedland and Alford 1991). In Thornton and Ocasio's words: "institutional logics shape and create the rules of the game, the means-ends relationships by which power and status are gained, maintained, and lost in organizations" (2008, p. 111). Institutional logics do not predict behaviour but explain why actors' behaviour is driven not by consequence but appropriateness with a certain logic. This means that we can only understand individual action if we study it through the institutional logic that underlies it. While logics explain individual action, institutional logics materialise through this action; individual action inscribes logics into

organisational structures and reproduces them (Friedland and Alford 1991). Thus, the concept “provide[s] a link between individual agency and cognition and socially constructed institutional practices and rule structures” (Thornton and Ocasio 2008, p. 108).

Conceiving society as an inter-institutional system, Friedland and Alford (1991) argued that individuals and organisations take part in multiple institutions of which each has its own belief system. In the context of an organisational field, scholars have argued that, while multiple logics may exist (even within a single organisation), usually one institutional logic dominates a field (Greenwood et al. 2002; Hensmans 2003). Yet, no logic has *a priori* primacy (Thornton and Ocasio 2008). Accordingly, if new logics emerge in a field or enter it, contradictions amongst competing logics trigger organisational responses which can entail organisational change (Greenwood et al. 2011; Reay and Hinings 2009). In fact, institutional logics are continuously in flux, demanding organisations to respond to potentially competing logics. Organisations respond to competing logics with decoupling (Boxenbaum and Jonsson 2008; Meyer and Rowan 1977), compromise (Oliver 1991) or a combination of the two (Pache and Santos 2013; Reay and Hinings 2009). Decoupling captures the superficial complacency with a logic while not implementing it on an operational level (Boxenbaum and Jonsson 2008). In compromising, organisations seek to comply with the minimum of multiple potentially conflicting logics in order to appear legitimate (Oliver 1991). When combining the two, they wield together elements from different logics forming new institutional patterns (Greenwood et al. 2011; Tracey et al. 2011). Pache and Santos (2013) found that organisations combine by selective coupling. That is, they form new institutional logics by selectively combining compatible elements of prescribed competing logics. While prior literature has argued for a dominant logic to emerge, Reay and Hinings (2009) investigated the coexistence of two competing logics on a field level. They found that pragmatic collaboration amongst actors drawing on the two competing logics entailed their coexistence on the field level. Their findings thus illustrate how competing logics at the field-level continue to coexist over an extensive time period due to reconciling activities at the organisational, group or individual level. These findings indicate that shifts in institutional logics and relationships amongst levels – individual, organisational, field and societal – create important mechanisms for organisational change (Battilana 2006; Friedland and Alford 1991; Thornton and Ocasio 2008). In fact, when logics shift, previously appropriate organisational activities may become delegitimate. Hence, a shift in an organisation or its field’s institutional logics can trigger deinstitutionalisation.

Oliver conceptualised *deinstitutionalisation* as “erosion or discontinuity of an institutionalized organisational activity or practice” (1992, p. 563). One tenet of organisational institutionalism revolves around the diffusion of ideas, beliefs and

values through an organisational field (DiMaggio and Powell 1983). These ideas, beliefs and values constitute interpretive schemes (Ranson et al. 1980). As organisations comply and adapt with an interpretive schema in their field, they inscribe its ideas, values and beliefs in their structural arrangements. Accordingly, structures are embodiments of an organisational field's interpretive schemes (Greenwood and Hinings 1988; Ranson et al. 1980). This tenet embeds organisations in a coercive and normative context suggesting complacency to be the rule and change unlikely. Yet, Greenwood and Hinings (1988) argued that, while these interpretive schemes provide stability, they can also provide grounds for change. That is, moving between interpretive schemes (or with a schema altering), organisations also adjust their structural arrangements; they change. Advancing the concept of deinstitutionalisation, Oliver (1992) built on this notion but argued that scholars have focused on how institutional changes manifest in changes to organisational structures. In her article, she took a step back, outlining the antecedents which can entail shifts in interpretive schemes and deinstitutionalisation. She outlined a framework of political, functional and social pressures which can originate at the level of the organisation or its environment. These pressures reflect possible causes for shifts in ideas, values and beliefs. Such shifts can render a particular institutionalised organisational activity delegitimate. She captured this process in the notion of dissipation, the “gradual deterioration in the acceptance and use of a particular institutionalized practice” (Oliver 1992, p. 566). This means that practices deinstitutionalise not because a better alternative has emerged but because they became inappropriate. In relation to change, organisational scholars have argued that deinstitutionalisation must occur as otherwise institutionalised practices were to continuously reproduce themselves entailing a never changing institution (Greenwood and Hinings 1996; Robey and Boudreau 1999). While institutional pressures may trigger subtle erosion of institutionalised practices, organisations (or actors external to a field or institution) may also proactively trigger deinstitutionalisation (Oliver 1992). For example, Maguire and Hardy (2009), studying the use of DDT – an insect pesticide – found that, through discourse, external actors triggered deinstitutionalisation of the practice of using DDT in agriculture. They illustrated how externally composed text can change the discourse on an established practice to become considered as inappropriate and by this engender its erosion. Hence, organisations – as actors – may perform activities to disrupt institutional arrangements and, thus, trigger their deinstitutionalisation and consequent organisational changes (Greenwood and Hinings 1996).

While organisational institutionalism originated from the field of organisational studies, it has found its way into IS research (Currie and Swanson 2009; Mignérat and Rivard 2009). In fact, Orlikowski and Barley (2001) called for IS researchers to adapt an institutional perspective. They argued that IS scholars tend to focus on and overemphasise the technical details of technology design, development and use,

ignoring the wider social context's influence on these activities. Accordingly, IS scholars may learn from organisational institutionalism to consider norms, beliefs and values – the social context – and how these shape and influence technology design, implementation, management and use in organisations. Mignerat and Rivard's (2009) review, in a special issue of the *Journal Information Technology* (see Currie and Swanson 2009) and the growing number of IS studies employing an institutional perspective (e.g. Berente et al. 2019; Nielsen et al. 2014; Tumbas et al. 2018) illustrated that IS scholars heeded Orlikowski and Barley's (2001) observation and call.

Similarly, Hinings et al. (2018) proposed institutional theory to study digital innovation and DT. They conceptualised DT as a cumulation of multiple digital innovations with digital innovations requiring legitimacy for their institutionalisation. Thus, they argued the need to investigate how digital innovations – as new institutional arrangements and thus, transformations of organising – become legitimate and institutionalised. Following Hinings et al.'s (2018) argument for organisational institutionalism offering a relevant perspective on DT, I propose that such a perspective reaches beyond the concepts of legitimacy and institutionalisation. That is, other institutional concepts – specifically deinstitutionalisation and institutional logics – also solicit insights into the phenomenon of DT.

In regard to deinstitutionalisation, Hinings et al. themselves claimed that DT “starts when there is disruption and destruction of established business models, value chains and organizational processes” (2018, p. 56), in other words, when established and taken for granted practices and meanings deinstitutionalise. The paucity on deinstitutionalisation in organisational studies (Greenwood et al. 2008; Maguire and Hardy 2009) is projected in IS research. A notable example is Nicholson and Sahay's (2009) study of the creation of new institutions in IS development and policymaking. Their findings illustrate how actors create and suppress dissensus over existing institutions for their process of deinstitutionalisation. Despite recognising that organisations, in particular incumbent firms, pursue changes to established and taken for granted organisational activities (e.g. Sebastian et al. 2017; Svahn et al. 2017), studies into DT have not employed the concept of deinstitutionalisation itself (bar, e.g. Zimmer et al. 2020). Yet, given its breaking with established rules, norms and practices, DT offers a promising context in which to study the institutional process of deinstitutionalisation. With its role in terms of change, the concept can reveal relevant insights into how organisations trigger erosion of taken for granted practices both on macro and micro levels. While it refers to erosion not enactment, it involves how actors purposefully trigger (i.e. enact) erosion of established practices to facilitate their DT. Hence, enacting DT does not only involve institutionalisation of “digital” but deinstitutionalisation of the established (but considered un-digital).

Unlike with deinstitutionalisation, IS research employing institutional logics to study DT has built on an extensive body of existing literature (e.g. Berente et al.

2019; Berente and Yoo 2012; Swanson and Ramiller 1997). In this tradition, Tumbas et al. (2015) studied how actors draw on institutional logics as they conceive digital technologies' affordances for innovation. The authors concluded that, depending on the institutional logic, actors can actualise different affordances. Hence, institutional logics influence actors' perception of digital technologies' affordances for digital innovation. While logics affect innovation practices, they also shape adoption of such innovations. In this vein, Tumbas and Vom Brocke (2017) investigated how born-digital companies gain legitimacy. They found that born-digital companies draw on the institutional logics circulating in the organisational fields of the incumbent companies with which they compete. Interestingly, born-digital companies may not only draw on the logics in one field but span several fields. If born-digital companies become renegades, this can entail shifts in logics requiring responses from incumbent organisations (Kondra and Hinings 1998). Consequently, while institutional logics influence perception of and behaviour toward digital technology and innovation, they are also a source of organisational change. Competing logics require actors to engage in reconciling their potentially contradicting prescriptions. Tumbas et al. (2018) adopted this perspective when studying how CDOs establish the new logic of digital against the existing logic of IT in order to carve out their jurisdiction. That is, through different strategies, CDOs leverage existing logics dealing with innovation while decoupling themselves from competing logics to develop digital on their own terms. More generally, researchers have argued that competing institutional logics can entail change at the field and organisational levels (Greenwood et al. 2011; Pache and Santos 2013; Reay and Hinings 2009). Thus, through studying potentially competing logics at organisations' macro and micro levels, we may understand organisations' DT activities and how these activities engender change.

In summary, organisational institutionalism offers various concepts to analyse and explain organisational and IS phenomena at the macro and micro levels (Currie and Swanson 2009; Greenwood et al. 2008; Orlikowski and Barley 2001). IS scholars have drawn on these concepts to study phenomena at the intersection of organisations and IT (Mignerat and Rivard 2009). One of these intersections is DT. In line with Hinings et al. (2018), I draw on organisational institutionalism – particularly deinstitutionalisation and institutional logics (see Table 6) – to investigate organisational DT activities.

Table 6. The key concepts of organisational institutionalism in this treatise

Concepts	Description	Literature
Institution	Taken for granted, repetitive social behaviour that ascribes and attaches meaning to social life. Thus, institutions reproduce social life. They occur on multiple levels including, individual, group, organisational, field or societal levels.	(DiMaggio and Powell 1983; Greenwood et al. 2008; Scott 1987, 2001)
Institutional Logics	Institutional logics are an institution's belief system. This belief system captures the material practices and symbolic constructions which an institution considers appropriate. Since they can be stripped from their institution, actors face multiple – sometimes competing – logics but can also actively draw on different logics to induce change. Organisations are institutionally pluralistic. That is, their structures and activities are grounded on multiple logics.	(Friedland and Alford 1991; Greenwood et al. 2011; Reay and Hinings 2009; Thornton and Ocasio 2008)
Deinstitutionalisation	Deinstitutionalisation refers to the erosion and abandonment of established and taken for granted practices, actions and behaviours in social exchange. It underlies the notion of change, i.e. if institutions were not to erode but prevail, they would infinitely remain unchanged. The concept thus captures the process and effect by which institutionalised practices erode and dissolve.	(Greenwood et al. 2008; Greenwood and Hinings 1996; Maguire and Hardy 2009; Oliver 1992)

2.3.4 Digital Infrastructures: Ecologies of Digital Technology

Infrastructure research has a long tradition in IS (e.g. Hanseth et al. 1996; Hanseth and Monteiro 1997; Star and Ruhleder 1996). Scholars have investigated the challenges of their design (e.g. Aanestad and Jensen 2011; Hanseth and Lyytinen 2010; Slavova and Constantinides 2017), control and coordination (e.g. Ciborra 2000; Constantinides and Barrett 2014; Venters et al. 2014) as well as change and evolution (e.g. Fürstenau, Baiyere, et al. 2019; Henfridsson and Bygstad 2013). However, despite this tradition, Edwards et al. noted in their special issue editorial that infrastructure “seems both an all-encompassing solution and an omnipresent problem, indispensable yet unsatisfactory, always already there yet always an unfinished work in progress.” (2009, p. 365). With this statement, they characterised infrastructures as a tensional and challenging but also intriguing phenomenon. In fact, unlike organisational improvisation or institutional theory, the concept originates from IS research. It provides theoretical explanations for understanding the empirical phenomenon of a complex class of IT artefacts, i.e. infrastructures. Yet, what is an infrastructure?

Defining the concept of infrastructure is a challenging quest. In their seminal work, Star and Ruhleder argued that “[c]ommon metaphors present infrastructure as a substrate: something upon which something else ‘runs’ or ‘operates’, such as a system of railroad tracks upon which rail cars run. [...]. It is something that is just there, ready-to-hand, completely transparent” (1996, p. 112). These metaphors indicate that, in colloquial language, the term “infrastructure” appears to be self-evident. It refers to a multitude of connected, distributed “things” which together form a constellated whole (although the “things” remain separate parts) which solicits services most fundamental to our daily lives, such as electricity, waterworks, rail tracks or streets. Thence, the whole is more than the sum of its parts. For scholarly discourse, however, these metaphors are inaccurate and unfunctional for grasping the relational nature of infrastructure (Star and Ruhleder 1996).

On their quest for a scholarly conceptualisation, Star and Ruhleder (1996) recognised the situatedness of infrastructure. That is, they claimed that something becomes an infrastructure in relation to an organised practice or activity. For example, waterworks are infrastructure for residents cooking their dinner, but they are the target object for city planners in a difficult equation of where to place pipes (Star and Ruhleder 1996). Drawing on this relational nature, Star and Ruhleder proposed to not ask what an infrastructure is but *when*. That is, when does something become infrastructure? Pursuing this question, they defined eight characteristics of infrastructures:

- *Embeddedness*: Infrastructures are embedded or sunk into social arrangements and technical structures.
- *Transparency*: Infrastructures invisibly support users in accomplishing tasks (i.e. transparent to use).
- *Reach or scope*: Infrastructures reach – temporally and spatially – beyond a single event or one-site practice.
- *Learned as part of membership*: Infrastructures are situated in a community of practice. New community members conceive infrastructures as a target object for learning and gradually obtain membership as the infrastructure becomes transparent.
- *Links with conventions of practice*: Infrastructures shape and are shaped by the social rules, norms and practices of their community of practice.
- *Embodiment of standards*: Infrastructures adopt other infrastructures’ standards to connect and plug in.
- *Built on an installed base*: Infrastructures are not built from scratch but always on something pre-existing (i.e. installed base) while wrestling with the inertia of the pre-existing and inheriting its strengths and limitations.

- *Visible on breakdowns*: Infrastructures become visible when they stop functioning.

Studying infrastructures, IS scholars have used different concepts including, e.g. information infrastructure, cyberinfrastructure, IT infrastructure, e-infrastructure, work infrastructure and digital infrastructure. While the specific focus of these concepts differs, they share the eight characteristics put forth by Star and Ruhleder (1996). In this treatise, with its focus on DT, I follow Tilson et al.'s (2010) call for infrastructure research into *digital* infrastructures. Yet, when referring to studies and concepts applicable not only to digital infrastructures but infrastructures *per se*, I merely use the term *infrastructure*.

Tilson et al. defined digital infrastructures “as shared, unbounded, heterogeneous, open, and evolving sociotechnical systems comprising an installed base of diverse information technology capabilities and their user, operations, and design communities” (2010, p. 748). They explained that digital infrastructures are in themselves digital artefacts *sui generis*. Being digital artefacts, digital infrastructures inherit the digital attributes innate in the digital technologies that constitute them (Kallinikos et al. 2013; Tilson et al. 2010; Yoo 2013). Hence, researchers found that digital infrastructures observe a crucial role in digital innovation and market-oriented activities (Grisot et al. 2014; Øvrelid and Bygstad 2019; Yoo et al. 2010). Prominent examples for digital infrastructures are Apple’s iOS or Google’s Android (Tilson et al. 2012). These examples illustrate digital infrastructures transition to genuine infrastructures in the sense of their canonical equivalents as electricity and waterworks (Edwards et al. 2009). They are the one artefact that underlies and drives DT inside and outside organisations as they become embedded and entrenched in our daily lives and organisations’ business operations; digital infrastructures render organisations functional (Tilson et al. 2010; Yoo et al. 2010).

Considering digital infrastructures’ centrality to organisations’ operations, scholars have studied their design and evolution (Fürstenau, Baiyere, et al. 2019; Hanseth and Lyytinen 2010; Henfridsson and Bygstad 2013). Infrastructure design, the outlining and development of an infrastructure’s parts (and their relation to each other), norms and standards, inscribes behaviour into infrastructures (Hanseth and Monteiro 1997; Iannacci 2010). Inscribed, these norms, rules and social arrangements become part of an infrastructure’s installed base (Aanestad et al. 2017; Venters et al. 2014). The installed base thus involves both social (e.g. user requirements, norms, social arrangements etc.) and technical elements (e.g. data standards, interface specifications, communication protocols etc.) (Aanestad et al. 2017). This installed base needs to be stable and easy to connect. Both stability and connectivity reduce barriers for users to plug in and hook up, i.e. to become part of the infrastructure (Hanseth and Lyytinen 2010; Tilson et al. 2010). Jointly with addressing user demands (Hanseth and Lyytinen 2010), stability and connectivity can overcome digital infrastructures’

bootstrapping challenge and, thus, accomplish network effects (Monteiro et al. 2013). While network effects capture the scaling of an infrastructure's value in correspondence with its user base (e.g. services can be exchanged amongst more actors) (Edwards et al. 2009), the bootstrapping challenge refers to establishing and growing this user base (Hanseth and Lyytinen 2010; Monteiro et al. 2013). Yet, simultaneously, a growing user base entails an increasing number of actors who take part in and contribute to its design and development. What results is a multitude of actors who share an infrastructure of heterogeneous systems in the present but with a different vision of its future (Hanseth and Lyytinen 2010).

IS researchers have addressed the challenge of multiple actors involved in infrastructure design in studies of work infrastructures (Hanseth and Lundberg 2001; Pipek and Wulf 2009). Work infrastructures support specific work tasks or "a field of work in an organisation" (Pipek and Wulf 2009, p. 450). Compared with "classic" infrastructures which deliver a standardised service (e.g. electricity or transmission of bitstreams), work infrastructures feature versatility and reflexivity. Versatility refers to the possibility of using them for multiple purposes in different fields of work (Pipek and Wulf 2009). That is, users can appropriate or modify them to innovate new uses (Grisot et al. 2014). Reflexivity means that design and use activities of work infrastructures occur within the same infrastructure and that parts of the infrastructure can be processed within itself as information (e.g. software) (Pipek and Wulf 2009). These features enable new design activities, and particularly help users to design infrastructures *in situ* and in use. In fact, both Hanseth and Lundberg (2001) as well as Pipek and Wulf (2009) argued that users should be seen as co-designers. The first stressed that this perspective is crucial if work infrastructures shall support new work practices. If the design activity is left with engineers outlining standards, work infrastructure runs the risk of deeper entrenching existing work practices rather than allowing for innovative and improved work practices (Hanseth and Lundberg 2001; Hanseth and Monteiro 1997). This perspective of users as co-designers underpins that multiple development trajectories may overlay each other, entailing that infrastructures tend to emerge differently than originally planned.

Ciborra and Hanseth (2000) suggested that infrastructure's multiple development trajectories engender infrastructure drift. That is, once an entity (e.g. an organisation) has set up an infrastructure, multiple actors' modifications and additions contribute to it drifting from its planned development trajectory. For example, who – not even the inventors such as Tim Berners Lee – could have foreseen the development of the Internet (Hanseth and Lyytinen 2010)? Pivotal in the phenomenon of infrastructure drift are the social (i.e. central and decentral control in organisational governance systems across a multitude of actors) and technical (i.e. gateways, interfaces and technical standards as control points) dimensions of infrastructure control (Koutsikouri et al. 2018). For example, Constantinides and Barrett (2014), studying

the development of a public health infrastructure, found that infrastructures evolve polycentrically and from the bottom up, involving contention over power relations, legitimacy and meaning. Concluding, they argued “for a more flexible approach given that absolute control is impossible and only leads to drift and unintended outcomes” (2014, p. 1). Tilson et al. (2012) showed the use of gateways (e.g. interface or communication protocol standards or accreditation of software and apps) as control points in Apple’s iOS and Google’s Android infrastructures. Further, Aanestad and Jensen (2011) illustrated that a modular implementation strategy can overcome the social inertia of multiple actors wrestling over adaptations for differing local requirements. Given this polycentric, or decentral, control over infrastructures’ development, IS scholars shifted their conceptualisation of infrastructure development to infrastructure evolution (Montealegre et al. 2019). That is, they recognised that infrastructures grow organically; they are not developed but evolve.

Infrastructure evolution involves the “gradual process by which a digitally enabled infrastructure changes into a more complex form” (Henfridsson and Bygstad 2013, p. 908). This gradual process is crucial for infrastructures’ success which is not down to their size and reach but to their ability to adapt to new user demands, i.e. to evolve (Hanseth and Lyytinen 2010). Yet, infrastructure evolution unfolds in tensional and hard to control dynamics grounded on their installed base (Ciborra and Hanseth 2000; Montealegre et al. 2019; Tilson et al. 2010). As Henfridsson and Bygstad’s definition noted, infrastructures change from something pre-existing into a more complex form. In this process, the pre-existing (i.e. the installed base) and embeddedness in other infrastructures create path dependencies (Star and Ruhleder 1996; Venters et al. 2014). Path dependency means that an infrastructure’s evolution depends on its past, on its installed base and its entrenched and established social practices and technical standards which have entailed the infrastructure’s becoming in the first place. It can both hinder and enable evolution (Hanseth et al. 1996). For this path dependency, infrastructures do not evolve in a jump or switch but in a gradual transition process. To facilitate this transition process, scholars have proposed a strategy of cultivating the installed base. This means that it is important to work with the pre-existing, thus influencing its evolution through interventions and impulses (Aanestad et al. 2017; Tilson et al. 2010, 2012). Hence, while scholars have argued that infrastructures’ evolution dynamics cannot be controlled, they noted that actors can influence and facilitate them. For this, however, we first need to understand these evolution dynamics.

For this reason, existing literature has studied infrastructures’ evolution dynamics from multiple perspectives. Tilson et al. (2010), taking a paradoxical view, conceptualised two paradoxes: the paradox of change and the paradox of control. The paradox of change refers to a tension between stability and flexibility. While the installed base needs to be stable for users to connect, it also needs to be flexible to

adapt to new user demands (Hanseth et al. 1996; Hanseth and Lyytinen 2010) albeit flexibility may hinder stability. Hence, the paradox of change involves striking a balance between keeping a stable installed base without falling into a technology trap (Hanseth and Lyytinen 2010). The paradox of control spans centralised and decentralised forms of infrastructure control. As existing research has found, centralised control over infrastructure evolution is a challenging task (Ciborra and Hanseth 2000). Moreover, it rules out the heterogeneous actors' demands and requirements in the ongoing change process. Therefore, scholars proposed a decentralised approach for infrastructure evolution (Constantinides and Barrett 2014). Fully decentralised control, however, takes any ownership from an infrastructure's initiator. Hence, to reap the benefits of their infrastructures, organisations need to find control points acceptable to the user base but effective in influencing – without thwarting – its evolution (Tilson et al. 2010). These paradoxes foreground the idiosyncratic and self-reinforcing tensions of infrastructure evolution. In contrast, a critical realist view can illustrate the mechanisms – the causal paths – of infrastructure evolution.

Taking a critical realist stance, Henfridsson and Bygstad (2013) identified the three generative mechanisms of innovation, adoption and scaling underlying digital infrastructure evolution. Their research built on the notion of digital infrastructures' generativity. That is, their incompleteness but openness to continuously evolves through multiple actors recombining, modifying and adding to their installed base creating potential uses yet to be conceived (Henfridsson and Bygstad 2013; Tilson et al. 2010). The innovation mechanism refers to an infrastructure's malleability through which actors create and spawn new services via recombination of resources. The adoption mechanism captures that the more users who adopted an infrastructure, the more resources were allocated to extend and improve it. This generated more revenue, hence more resources and, for the improved infrastructure, again more users. The scaling mechanism explains an infrastructure's extension of reach through attracting and involving more partners. All three mechanisms are self-reinforcing and interact, i.e. they are contingent on each other and the resulting evolutionary path.

Infrastructures' evolutionary paths can entail substitution of infrastructures, abandonment or complete embeddedness, thus blurring all formerly perceived boundaries. Fürstenau and Baiyere et al. (2019) studied this aspect of the infrastructure evolution process developing a model of infrastructure embeddedness. Their model recognises three processes: (1) parallel evolution entailing two separate, independent infrastructures; (2) competitive evolution involving two infrastructures wrestling over resources from which only one emerges subsuming the others' connections and nodes; and (3) spanning evolution encapsulating the unification of two infrastructures through creating connections and nodes such that their boundaries

dissolve. Besides research delving into infrastructures as an object of research itself, scholars also studied how infrastructure evolution shapes organisations.

Star and Ruhleder (1996) found that something becomes an infrastructure in relation to the practice in which it is situated. They also noted that users learn infrastructure as part of a membership. Hanseth and Monteiro (1997) then argued that design activities inscribe existing social arrangements into infrastructures. Hence, learning these infrastructures and becoming a member, users also adapt the inscribed behaviour. This suggests that users' practices and infrastructure evolution share a reciprocal relationship (Dourish and Bell 2007; Iannacci 2010). In this vein, Giraldo-Mora et al. (2019) studied how infrastructures and their evolution drive organisational change. They identified three mechanisms: architectural, institutional and functional. The first refers to architectural evolution of digital infrastructures shaping organisational structures. The second captures that institutional norms embedded into infrastructures extend to sites adapting this infrastructure. The last grasps that infrastructures allow certain functionalities and thus infrastructure evolution shapes services. Moreover, the authors found that these mechanisms are nested; an evolutionary path may start with one mechanism but is mediated by the remaining two. Hence, Giraldo-Mora et al.'s (2019) study illustrated how digital infrastructures' evolutionary paths shape organisations.

In sum, for their DT, organisations not only rely on one specific digital technology but several interconnected technologies forming an ecology. This makes conceptual lenses that look beyond single systems particularly powerful to investigate and dissect related IS phenomena (Henfridsson and Bygstad 2013). Scholars have proposed digital infrastructures as such a conceptual lens (Tilson et al. 2010). Inheriting the attributes of the digital technologies that constitute them, digital infrastructures' generativity spans across multiple sites and actors and their longevity that renders them essential for organisations' DT (Constantinides et al. 2018; Tilson et al. 2010; Yoo et al. 2010). Digital infrastructures also provide building blocks for work infrastructures and digital innovation (Grisot et al. 2014; Pipek and Wulf 2009). Thus, they have a pivotal role in organisations' DT. Considering its research tradition and nature, literature on digital infrastructures provides concepts elucidating both macro- and micro-level aspects of related phenomena. In particular, studies delving into infrastructure evolution have paid close attention to the macro- and micro-level activities that form infrastructures' tensional evolutionary paths (e.g. Constantinides and Barrett 2014; Monteiro et al. 2013). Table 7 summarises the definitions of the key concepts which this treatise borrows from digital infrastructure research.

Table 7. The key concepts of digital infrastructure research in this treatise

Concepts	Description	Literature
Digital Infra-structures	Digital infrastructures are “shared, unbounded, heterogeneous, open, and evolving sociotechnical systems comprising an installed base of diverse information technology capabilities and their user, operations, and design communities” (Tilson et al. 2010, p. 748). Underlying platforms, ecosystems, virtual markets and digital innovation, the notion of infrastructure provides a powerful lens for studying the IT artefact in DT.	(Constantinides et al. 2018; Grisot et al. 2014; Kallinikos et al. 2013; Tilson et al. 2010; Yoo 2013; Yoo et al. 2010)
Infrastructure Evolution	Infrastructure evolution refers to the gradual change process of an infrastructure into a more complex form. Given the multitude of actors involved, scholars conceptualise this process as organic growth and evolutionary rather than a process of building and developing. As they evolve, infrastructures wrestle with the technical and social inertia of their installed base. These struggles reveal themselves in a set of self-reinforcing evolution dynamics.	(Ciborra and Hanseth 2000; Fürstenau, Baiyere, et al. 2019; Giraldo-Mora et al. 2019; Henfridsson and Bygstad 2013; Tilson et al. 2010)

3 Research Approach

The research approach marks a study's philosophical foundations, methodological choices and research methods for constructing empirical material and conducting its analysis. It comprises the activities which IS scholars perform on their quest to answer their research question(s). In qualitative studies, these activities follow an iterative process (rather than a linear sequence of predefined steps) moving amongst construction of empirical material, analysing this material and consulting the theoretical framing (Maxwell 2009). In this chapter, I outline the research approach of this dissertation. To investigate AutoCo's DT activities, I have chosen the methodology of ethnography. Yet, before I describe my fieldwork at AutoCo, I discuss a set of philosophical considerations, namely two central concepts in the philosophy of science (i.e. ontology and epistemology), research approaches within the field of IS and the principles for the research approach in my dissertation.

3.1 Philosophical Considerations

The philosophy of science provides researchers with different worldviews to think about reality and how to understand it. These worldviews embody assumptions for ontology and epistemology which render different aspects of the world salient (Burrell and Morgan 1979). They are thus foundational for designing, executing and reflecting any research endeavour, or put differently: "Science, with a capital S, is an invention of philosophers" (Fuchs 2001, p. 6).

3.1.1 The Underpinnings of Philosophical Worldviews: Ontology and Epistemology

Ontology and epistemology are two central concepts in the philosophy of science. They convey the underpinnings of the different philosophical worldviews that researchers employ when studying a phenomenon. *Ontology* defines what is out there in the world, i.e. what is, and the nature of reality (Lee 2004; Orlikowski and Baroudi 1991). Ontologically, we can differentiate between two poles (Burrell and Morgan 1979). The first pole conceives reality as subjective. This means that the world does not hold an external reality which can be observed and objectively described but is

constructed. The second pole views reality as objective. Accordingly, an external reality exists outside human beings and research seeks to capture this external reality (Burrell and Morgan 1979; Orlikowski and Baroudi 1991). Both views are prominent amongst social scientists (including IS researchers). While I have described ontology as comprising two poles, different philosophies are neither fully subjectivist nor objectivist (Burrell and Morgan 1979). Thus, ontology is better framed as a continuum between these two poles of “what reality is” and, thus, of what researchers can create knowledge.

Assuming an ontological continuum, I refrain from understanding the question of ontology as an either/or but as a nuanced in-between. While I conceive some types of research (e.g. the natural sciences) as studying an externally existing reality (i.e. objectivist), other types of research (e.g. social sciences) investigate a constructed reality of meanings (i.e. subjectivist). Yet, we can also find research within the social sciences taking the stance of an externally existing reality. Thus, I find a classification of ontology as an either/or as being neither accurate nor helpful. For example, if we assume a fully subjectivist reality, the endeavour of science becomes somewhat obsolete. If any knowledge of reality was purely subjective, why bother sharing it? In interaction with any of its readers, this work would then construct infinite different meanings of my observations. Yet, I understand the purpose of my research to facilitate a common understanding of DT. Phenomenology refers to this as intersubjective meaning (Burrell and Morgan 1979). This implies that multiple subjects can construct shared understanding. However, with this stance, I also move away from a fully subjectivist reality as it assumes that some (or all) meaning can become intersubjective (i.e. shared) and, thus, external to the knower. Yet, how is it possible to create knowledge of constructed but shared meanings? This is a question of epistemology.

Epistemology refers to the creation and nature of knowledge: what counts as knowledge and the act, actions, or activities through which we construct or produce such knowledge (Burrell and Morgan 1979; Myers 1997). The concepts of epistemology and ontology are interdependent and imply constraints on researchers' knowledge claims. That is, conceiving external reality as subjective, researchers can create knowledge of this reality by studying its construction through interactions, language and symbols. Yet, inherent to the subjectivist ontology, their knowledge creation is itself a construction of reality and, thus, only a reconstruction of what they observed (Myers 1997). Research that studies language, symbols and meaning making is thus inadequate to produce law-like knowledge of the world but effective for exploration and building theoretical explanations. Conversely, research that assumes an objective, external reality seeks to produce law-like knowledge: statements that hold true regardless of the observer, time and place.

Positioning my research at the subjectivist end of the ontological continuum thus involves epistemological implications. DT becomes a phenomenon constructed through interactions between human- and non-human actors and can then only be understood by taking a constructivist epistemology which focuses on language, symbols and meaning making. I differentiate between human- and non-human actors as the phenomenon of DT is not without any materiality. That is, the digital technologies underlying this phenomenon, their materiality and the affordances they solicit to human actors, as well as the latter's interpretations of that materiality, constitute a significant role in the enactment of DT. Considering the phenomenon under study a construction, I admit that its construction between these pages is contingent upon the circumstances of my fieldwork. That is, it builds on my observations of events and activities in the field, and these field events could always have been otherwise. In the ontological view of an objective, external reality, this contingency was a lethal bullet for any knowledge claims inferred from my fieldwork. In the ontological view of a subjectivist reality, it is intrinsic to knowledge creation. This discussion of ontology and epistemology on the backdrop of my research illustrates these concepts' interdependency. Hence, I understand them as two sides of the same coin. Staying with this coin metaphor, I view philosophy of science as a treasury of multiple possible combinations of ontological and epistemological assumptions constituting various worldviews. These worldviews underlie different research approaches.

3.1.2 Selecting an Information Systems Science Research Approach

The above discussion on ontology and epistemology illustrates that no universal way of understanding empirical phenomena exists. In fact, the IS community has argued for being pluralistic in its research approaches (see, e.g. editorial statements of the basket of eight journals). In this section (for the sake of simplicity), I follow the widely used classification into three research approaches, namely, positivist, interpretivist and critical approaches (Chen and Hirschheim 2004; Orlikowski and Baroudi 1991). Note, however, that this classification is not exhaustive. Other research approaches in IS are, e.g. feminist (e.g. Richardson 2009), critical realist (e.g. Mingers 2004) or agential realist approaches (e.g. Orlikowski and Scott 2008). Each of these research approaches comprises different assumptions on ontology and epistemology. Thus, depending on their research approach, scholars assume different methodologies and research methods as (in)appropriate ways of coming to understanding the world (Cecez-Kecmanovic and Kennan 2018).

Positivist approaches share the ontological assumption of the world existing independently of humans and their social actions. Hence, positivist research approaches endeavour to reveal an objective, externally existing reality (Benbasat et

al. 1987; Orlikowski and Baroudi 1991). In this vein, positivist studies focus on hypotheses and theory testing, cause and effect relations and predictions, and assess their results against validity, reliability and reproducibility (Benbasat et al. 1987). Given that reality exists independent of human action, researchers assume a neutral and passive role. They thus share results value free and without judgement; reality exists regardless of any human interference (Orlikowski and Baroudi 1991).

Interpretivist approaches ontologically assume the world to be an emerging process of social action. Reality thus exists only through human action constructing and reconstructing subjective meaning (Klein and Myers 1999; Walsham 1995). Interpretivist studies assume that we can understand this subjective meaning only through interpretation. They thus build on modes of enquiry which study phenomena in the field and focus on human action and language (spoken and in text form) and how it constitutes reality (Myers 1997; Walsham 2006). Reconstructing their informants' values, interpretivist approaches are not value free (Orlikowski and Baroudi 1991).

Critical approaches assume a mixed reality. While they understand the world to be constructed and reconstructed, they also consider it to comprise objective elements (Ngwenyama 2002; Orlikowski and Baroudi 1991). For enquiring about the world, they build on similar assumptions as interpretivist approaches, i.e. naturalistic methodologies. Yet, critical approaches deviate in their central endeavour of exposing and criticising the status quo. For this, they relate phenomena to a wider societal topic (e.g. capitalism), thus seeking to reveal and pinpoint restrictive features, conflicts and repression to initiate change (with the goal of improving the world) (Lyytinen and Klein 1985; Ngwenyama and Lee 1997). Thus, critical approaches carry the values of both the researchers and the reconstructed reality.

The three research approaches are at the centre of the IS field's debate on its philosophical underpinnings. Within this debate, IS scholars have engaged in reviews of IS literature to investigate these underpinnings. For example, in 1991, Orlikowski and Baroudi reviewed behavioural IS literature published from 1983 to 1988 in four major IS outlets. Their review was concerned with the "philosophical worldview that underlies much of the activity constituting the field of behavioural information systems research" (p. 4). Looking into their sample of 155 articles, they found that 96.8% follow positivist approaches, only 3.2% featured interpretivist approaches with critical approaches being absent. They argued that this lopsided use of research approaches "may be limiting the kinds of knowledge we are gaining about information systems phenomena" (p. 24). They thus called for IS researchers to critically assess their choice of research approaches, not to replace the positivist approaches, but to nurture plurality. After all, this debate is not only a matter of philosophical worldviews, but of research questions, problems and phenomena that IS scholars seek to (and can) investigate, thus, definitional of the field.

Thirteen years later, in 2004, Chen and Hirschheim reassessed the body of IS research. They adopted Orlikowski and Baroudi's work as the starting point of a debate signalling the IS community's intention to become a more pluralistic research field (reflected, e.g. in special issues, panel discussions and appointments of journal editors). The question driving their review was therefore how this intention manifests in journal publications. Examining 1,893 articles published from 1991 to 2001 in eight major IS outlets, they found that, since Orlikowski and Baroudi's (1991) review, the debate on research approaches in the field of IS had not manifested in journal publications: 81% of the publications in their sample followed a positivist research approach and only 19% an interpretivist one (the review excluded critical approaches). Hence, more than a decade after Orlikowski and Baroudi's review, IS research still largely followed a positivist research approach.

Similarly, but assessing the IS research approaches from the methods' perspective, Cecez-Kecmanovic (2011) problematised IS researchers' narrow focus on research methods. She postulated "that the IS research suffers from an overemphasis on methods while largely disregarding their inherent limitations and broader methodological issues" (p. 11). Accordingly, the IS community seems more concerned with the rigorous application of a given method than with its philosophical underpinnings and, thus, the adequacy to investigate the phenomenon under question. What is missing is a critical engagement, reflection and assessment of the IS field's underlying philosophical assumptions of these methods (Cecez-Kecmanovic 2011), that is, to understand these assumptions not as given but as debatable and mutable and, thus, a subject of enquiry themselves (Cecez-Kecmanovic and Kennan 2018); or in Lee's words: "No ideas on ontology, epistemology, methodology and methods are sacrosanct and immutable. They can and should always be further developed." (2004, p. 14).

The above discussion revisits the research approaches in IS. While it sketches parts of an important debate, its purpose is not to label IS research of suffering from a dominant approach. Rather, I intended to underline two considerations. First, the interplay between research approaches (their underlying philosophical worldviews), methodologies, research methods, phenomena and research questions under study; conversely, certain phenomena and research questions are best investigated following a certain research approach. However, this also means that we can only understand what a research approach means if we relate its parts to the whole (and vice versa) (Myers 1997). Second, when we consider research approaches, we should neither understand them as fixed nor regard their underpinnings as dogmas. Rather, we should critically reflect their parts and how they can individually and as a whole assist our investigation of a phenomena. To understand, assess and evaluate the knowledge creation within these approaches, we thus need to consider their underlying assumptions.

Combining these considerations, I view research approaches not as a one-time choice but as tuning instruments. They help and facilitate us in attuning our thinking and meaning making of the world to certain problems or aspects of that world within the confines of a research endeavour. The considerations in these research approaches thus go beyond mere questions of rigorously applying methodologies and research methods but postulate the graver questions of “what is” (and “what is not”) and how can one investigate “what is.” They are instruments of and for thinking about the world and how we become knowledgeable about this world. They illustrate that there is *not one true answer* to “what is knowledge” or “how to create knowledge” but that these questions are relational to our research approaches and in themselves worth – mandatory – enquiring, if we intend to grasp what may be going on here.

Reflecting my philosophical considerations in the previous section, I found my own approach to fall within the characteristics of interpretivist approaches. First, I found my ontological and epistemological assumptions of a subjective reality understood through a constructivist view to best corroborate with the underpinnings of interpretivist approaches. Second, I framed the phenomenon under study as an issue of interaction between human and non-human actors (e.g. material aspects of the world). That is, I formulated the research problem as an issue of social construction. Consequently, it lends itself to the interpretivist assumption of understanding the world through studying social action (Klein and Myers 1999). Third, I have chosen a naturalistic mode of enquiry (see 3.2 On Ethnography, Fieldwork and Participant Observations). Literally, I decided to go to “where the action is” (Myers 1999) in order to study the phenomena in its natural context. Lastly, although I found taking a critical approach tempting, I have not taken the leap to critically reflect on my findings in terms of a wider societal topic or to question the status quo. Thus, my research approach fits best with the characteristics of interpretive approaches. However, I do not conceive this label (or any research approach label) as ultimately defining the do’s and don’ts of respective studies. Rather, each approach provides a set of principles which guide the research process but is subject to researchers’ interpretation. The next section outlines principles of interpretivist research approaches.

3.1.3 Principles for Interpretivist Research Approaches

IS scholars following interpretive research approaches have published principles for such work (e.g. Klein and Myers 1999; Myers 1997; Walsham 1995). In addition, we can find principles and criteria for ethnographies, which represent a methodology apt for interpretive research approaches (e.g. Golden-Biddle and Locke 1993; Myers 1999). Yet, these principles do not outline a recipe for such research. Rather, they facilitate scholars in interpreting and reconstructing the phenomenon under study as

truthfully as possible. However, they can also serve as grounds to assess interpretive research's credibility. In this section, I thus outline principles for interpretivist research in general and the methodology of ethnography in particular.

In 1995, Walsham discussed three aspects of interpretive research: the researcher's role, evidence from interviews and reporting methods. However, in this early article, he concentrated on "how-to" guidance rather than evaluation criteria. Nonetheless, what stands out from his article is the importance of reflexivity. That is, interpretive researchers should explicate and carefully reason their methodological choices, e.g. on the role they have taken during the research process and "how they have arrived at their 'results'" (1995, p. 79). In his later work, Walsham (2006) then moulded his principles into a set of four questions for examining interpretive research: (1) Who will be the readers of our work?, (2) Which literature do we aim to contribute to?, (3) What new concepts does our research offer to both audience and literature? and (4) How should other researchers use our work? These questions can guide the design and execution of the research process but also its evaluation.

We can find similar guidance in Klein and Myers (1999). Concerned with the conduct and evaluation of interpretive research, they drew on anthropology and the philosophies of phenomenology and hermeneutics to derive a set of seven principles. These principles shared with Walsham (1995, 2006) a focus on reflexivity. That is, they called attention to the critical reflection of and sensitivity to researchers' process of *verstehen* (en: understanding). For example, their first principle suggests a hermeneutic analysis, i.e. to iterate between the whole and its parts to comprehend the subject under study. Similar to reflexivity, their seventh principles stresses suspicion, i.e. sensitivity about possible distortions in collected narratives. While these principles can facilitate researchers taking an interpretivist approach, the authors cautioned their readers to not misconstrue them as hard rules for conducting or evaluating such research.

Besides these principles for interpretive research, scholars have put forth criteria for ethnographies (e.g. Golden-Biddle and Locke 1993; Myers 1999). Myers (1999) positioned ethnography as one methodology within interpretive approaches and outlined similar criteria as in his article on interpretive research (Myers 1997). He formulated four questions which researchers conducting an interpretive ethnography should consider: (1) Is this a contribution to the field?, (2) Does the author offer rich insights?, (3) Has a significant amount of material been collected? and (4) Is there sufficient information about the research method? (Myers 1999, p. 11f.).

Taking a different approach, Golden-Biddle and Locke (1993) analysed a set of published ethnographic texts to examine how these convince their readers. They engagingly outlined that these texts establish authenticity, plausibility and criticality. *Authenticity* refers to the text demonstrating that the author has indeed been there (in the field) and offers a genuine field experience. A text creates *plausibility* if it

connects to its audience outlining and addressing a matter relevant to the personal and professional experience of its readers. Simply put, readers consider a text plausible if its structure and its empirical as well as conceptual descriptions makes sense to them. *Criticality* focuses on the text's ability to challenge the readers taken for granted assumptions. Myers (1997, 1999) referred to this as "contradict[ing] conventional wisdom." Golden-Biddle and Locke (1993) argued that an ethnography should at least provide for authenticity and plausibility making criticality a feature of outstanding ethnographic work. Moreover, while authenticity focuses on the practice of fieldwork, plausibility offers guidance for the subsequent deskwork: the writing up of ethnographies (Schultze 2000).

Researchers have referred to and utilised the criteria of Golden-Biddle and Locke for evaluating the quality of both ethnographies and interpretive work. For example, Walsham (2006) drew on these criteria, arguing that interpretive research should strive for authenticity, plausibility and criticality in order to establish credibility and convince its readers. In her seminal ethnography, Schultze (adapted from Schultze 2000) used Golden-Biddle and Locke's three criteria to evaluate her research. For this, she developed requirements specifying each criterion. She then illustrated how her research fulfilled these requirements and, thus, met the criteria of a high-quality ethnography. Table 8 is an adaption of Golden-Biddle and Locke's (1993) criteria and Schultze's (adapted from Schultze 2000) requirements for these criteria.

Table 8. Criteria and their requirements for high-quality interpretive research following an ethnographic methodology (Golden-Biddle and Locke 1993; Schultze 2000)

Criteria	Requirements (adapted from Schultze 2000)
Authenticity <i>(Demonstration of the authors' field experience being genuine)</i>	<p>Authors establish authenticity by offering descriptions or understanding of the following:</p> <ul style="list-style-type: none">• Everyday life as lived by members of the field• Field members lingo, i.e. everyday language• Field members' thoughts on life in the field and/or on the field itself• Who the ethnographer talked to and observed• The nature of the researcher's relationship with people in the field• The response of others on the scene to the researcher's presence• Researcher's pre-understanding of the field and the studied scene• Researcher's interest in the field and the scene• Details on the research process:<ul style="list-style-type: none">◦ Mode of entry, participation and exit◦ Length of the stay◦ Construction (and collection) of empirical material and its analysis (e.g. whether theoretical concepts "emerge" from the data or whether they were imposed on the data)• Provide representational material (e.g. excerpts from field notes, documents or interviews)• Relationship between the fieldnotes and the written ethnography• Conduct <i>post hoc</i> respondent validation
Plausibility <i>(Research and its findings have relevance for the readers)</i>	<ul style="list-style-type: none">• Adhering to academic writing conventions• Justifying the research and differentiating its contribution by situating it within ongoing research streams or presenting theoretical novelty• Normalising atypical research conditions and aligning the findings with common, everyday experiences
Criticality <i>(Research and its findings provoke readers to question conventional wisdom)</i>	<ul style="list-style-type: none">• Inviting readers to pause and think about specific observations• Provoking readers to answer questions• Guiding readers through imagining ways of thinking and acting differently• Cultural juxtaposition

In this section, I have outlined different sets of principles for interpretive and ethnographic research. They illustrate the underlying assumptions of interpretive research approaches. In other words, interpretive research does not produce facts but endeavours to access other people's interpretations and meaning making. It does not seek objective truth but an intersubjective understanding of how reality comes into being through human action and interpretation thereof. The bottom line of these principles is thus the reflective and detailed reporting of the research process, the "what"

and “how” of constructing empirical material, its analysis and its skilful write-up to establish authenticity, plausibility and criticality. I have decided to present multiple sets of such principles to point out their commonalities and even interrelation (see, e.g. Walsham 2006 referring to Golden-Biddle and Locke 1993; or Myers 1997, 1999). In my research, I have, however, followed only one set, specifically, Golden-Biddle and Locke’s (1993) criteria for ethnographies. First, I found these criteria to lend themselves well to both interpretive and ethnographic research (cf. Walsham 2006). Second, since interpretive research can build on other methodologies (e.g. case studies), Klein and Myers’s (1999) principles, e.g. offer guidance (and evaluation criteria) for interpretive research in general, but not for the special reporting of ethnographies. Hence, since Golden-Biddle and Locke’s criteria provide guidance for both interpretive research in general and ethnography as a methodology in particular, I found their principles of valuable guidance. For illustrating that my research fulfils the three criteria, I adapted the requirements which Schultze (2000) developed as an extension of Golden-Biddle and Locke’s criteria (see 6.5 Authenticity, Plausibility and Criticality: Evaluating this Research). Schultze’s requirements specify these criteria beyond their textual establishment to the actual fieldwork that underlies ethnographies. Next, I describe ethnography as a methodology before outlining the particularities and details of my conduct of ethnography.

3.2 On Ethnography, Fieldwork and Participant Observations

This work builds on empirical material collected and constructed during an ethnographic field study. In July 2017, I entered the field starting a fixed-term position as an internal organisational consultant and PhD candidate at AutoCo (for the description of the research site see 4 Research Site: AutoCo). In June 2020, I exited AutoCo after my contract had ended. Hence, I draw on a three-year field study during which I collected as well as constructed the empirical material for articles I to V which form the basis of this treatise. In the field (and after), I have followed the methodology of ethnography and its guidance on its research methods of fieldwork, participant observations and the use of archival records (i.e. documents and digital data). This chapter first outlines ethnography as a methodology and my reasoning for choosing this methodology. Subsequently, I provide details on my fieldwork, the collected and constructed empirical material and its analysis.

3.2.1 The Methodology of Ethnography

Ethnography is a methodology of naturalistic enquiry (Guba 1981). Originating from anthropology, ethnography has become an acknowledged approach for

organisational enquiries (Eberle and Maeder 2016; van Maanen 2011b) and IS phenomena (Myers 1999). By definition, ethnographers write about people (van Maanen 2011b). Yet, to write about people, researchers who become ethnographers must first immerse themselves in the field over an extended time period to follow the notion of “going native.” This notion conveys the idea of “learning from people” (Myers 2009a) about their (organisation’s) language, symbols and meaning making of a certain phenomenon by “taking close to the same shit others take day-in and day-out (or, if not taking it directly, hanging out with others who do)” (van Maanen 2011a, p. 220). Hence, “fieldwork of the immersive sort is by and large definitional of the trade” (van Maanen 2011a, p. 219) and affords the strength of ethnographies: its possibility to provide rich and in-depth insights (Eberle and Maeder 2016; Myers 1999). The process of ethnographic enquiry comprises three phases: entrance to the field, being in the field and returning from the field.

Entrance to the field marks an important moment in ethnographies. First, ethnographers must negotiate access. This often involves interaction with gatekeepers at whose will researchers are allowed to observe organisational activities (Crang and Cook 1995). This renders ethnographies a political matter of access, position and identity in the field (Myers 2009b). Consequently, ethnographers often have to deal with suspicion against their cause. After all, informants know little about the practices of ethnographers and sharing their view puts them at risk with members of their organisation (Eberle and Maeder 2016). Yet, while access must be negotiated, the more important moment is that of ethnographers’ thrownness at the field (Chughtai and Myers 2017). When ethnographers enter the field, they throw themselves, their assumptions, historicity and prejudices at the field. This baggage – their own background – affects their entrance, their reception and most of their subsequent field experience (Chughtai and Myers 2017). This “thrownness” highlights the importance of understanding ethnographers as research instruments (Golden-Biddle and Locke 1993; Myers 1999; Schultze 2000). Their background influences what estranges them and, thus, what they notice. In this regard, their observations, and especially their interpretations of these observations, only make sense against the backdrop of their own historicity, assumptions, prejudices and *a priori* ideas about the field (van Maanen 2011b). Hence, their write-ups express interpretations mediated by their own background. This makes a reflective approach to ethnographic research crucial as the studied phenomena can only be understood within their context and against the researcher’s background (Klein and Myers 1999).

In the field, ethnographers rely on natural and intuitive forms of understanding: “in the conduct of our research, we [ethnographers] meet people. We talk with them, we ask them questions, we listen to their stories and we watch what they do. In so far as we are deemed competent and capable, we join in” (Ingold 2014, p. 386). Scholars refer to this method for understanding the world as participant observations,

the primary mode of enquiry in ethnographies. “[E]thnography usually involves the researcher participating, overtly or covertly, in people’s daily lives for an extended period of time watching what happens, listening to what is said, and/or asking questions [...] – in fact, gathering whatever data available to throw light on the issues that are the emerging focus of inquiry” (Hammersley and Atkinson 2007, p. 3). Although researchers have pinpointed this and other characteristics of ethnography, there are no strict rules or conventions for conducting ethnographies, but “[o]ne becomes an ethnographer by doing it” (van Maanen 2011a, p. 219). Yet, with ethnography becoming increasingly popular, researchers, who have become ethnographers themselves, started providing methodological guidance. In particular, this pertains to how to conduct participant observations (e.g. Atkinson and Hammersley 1994; Eberle and Maeder 2016; Myers 1999) and compiling field notes (e.g. Emerson et al. 2001; Myers 2009b) or writing up an ethnography which is convincing (e.g. Golden-Biddle and Locke 1993; Jarzabkowski et al. 2014).

Leaving the field, ethnographers take with them a bag of good stories and insights encapsulated in their lived experiences, notes, memories and other empirical material (e.g. archival records, digital data). They draw on this bag of stories to write tales of their observations and experiences. Compiling these tales, they engage in “textwork, headwork and textwork” to share what we can learn from their observations in regard to the phenomena under study (van Maanen 2011a). These “tales from the field” can take different forms.

In my ethnographies, I have mostly adhered to the four writing conventions of what Van Maanen (2011b) outlines as realist tales. In a *realist tale*, ethnographers remove their presence from the write-up. This style of writing objectifies their observations (van Maanen 1995). Moreover, realist tales report minutely what the ethnographer observed in the field. This attention to detail renders the write-up compelling; it actually happened this way. They provide this detailed account from the natives’ perspective. Lastly, interweaving the ethnography with a theory connects the observations to a problem of interest within the ethnographer’s discipline. This grants them omnipotence over the observations’ interpretation; “the ethnographer has the final word on how the culture is to be interpreted and presented” (van Maanen 2011b, p. 51). I have reported my field experience in the style of realist tales for I found its conventions to best reflect the writing style and focus on theory in IS research. Despite its pluralist intention, the IS field, and in particular its journals and conferences, has its peculiarities when it comes to evaluating qualitative and interpretive work (Cecez-Kecmanovic and Kennan 2018; Orlikowski and Baroudi 1991) and ethnographies in particular (despite famous IS ethnographies, e.g. Zuboff 1988). To find a home for my research within the IS community, I thus decided to blend ethnography with what I comprehended as acceptable reporting of interpretive and qualitative research.

For reporting ethnographies, Jarzabkowski et al. (2014) suggested three writing strategies: vignettes, composite narratives and processual narratives. *Vignettes* present a condensed and focused description of a particular event or incident in the field. They evocatively describe a brief time span of observed actions which are bound to specific (a) actors or spaces (Miles and Huberman 1994). Since vignettes are concise and brief, they allow ethnographers to interlace thick descriptions of exemplary observations with explanations of their interpretations or to illustrate the richness of their empirical material. They serve well in outlining a specific concept (Jarzabkowski et al. 2014). *Composite narratives* mould multiple observations scattered across time and space into one narrative (Jarzabkowski et al. 2014). They reveal patterns which underlie these observations. A typical example of a composite narrative is a slice of life – a day in a key actor’s life – description. While the events, actions and incidents described in such a narrative may not be observable every day, they are nonetheless typical for the key actor’s life. The ethnographer establishes this “typicality” through connecting the narrative to a vast body of empirical material, while illuminating the identified pattern in one composite narrative presenting the puzzle of multiple observations as a whole (Jarzabkowski et al. 2014). *Processual narratives* focus on the temporal and processual nature of ethnographic material. Observing phenomena over an extensive time, ethnographers generate empirical material which captures the phenomena’s processual dynamics. This makes ethnography a suitable methodology to study both the micro-dynamics as unfolding on the spur of the moment and the flux of macro-level patterns of organising. Processual narratives’ strength lies in moving between these micro-dynamics and macro-level patterns. Zooming in and out, these narratives relate specific observations to wider changes in strategy, organisations or markets and establish coherence by revisiting key actors (Jarzabkowski et al. 2014). Shared across these three strategies is a narrative approach toward studying empirical material (Cortazzi 2001; Czarniawska 1998).

Narratives present the most basic form of learning, i.e. storytelling. Through storytelling, people enact their lived experience and convey the meaning they ascribe to it. Narrative analysis seeks to reveal this meaning that narratives give to actors, events and phenomena (Cortazzi 2001). “In its most basic form, a narrative requires at least three elements: an original state of affairs, an action or an event, and the consequent state of affairs” (Czarniawska 1998, p. 2). Yet, it is the underlying plot which connects these elements into a whole, thus conveying certain descriptions, interpretations and explanations (Cortazzi 2001; Czarniawska 1997, 1998). The most basic type of a plot is chronology which presents actors, events and actions in their sequence in time. While this sequence can reveal patterns, actors can relate a narrative to certain roles, social networks or demographics. Similarly, a narrative’s voice reveals its point of view, and its moral context indicates underlying assumptions and values (Pentland 1999). Ethnographers confront narratives in their own texts (e.g.

field notes, memos, transcripts) and informants' texts (van Maanen 2011b). Approaching these through narrative analysis, they identify these text's structural elements and plot to uncover their meaning making. They relate otherwise separate and standalone texts (e.g. from different authors or levels of analysis) and place them in a discourse over time and space. What they learn, they compile in a new text presenting a narrative which conveys their interpretation of the field. This turns narrative analysis into the practice of both "reading and writing the field" (Czarniawska 1998).

The above description outlined the three phases of ethnographic fieldwork and related techniques. Across these phases, I have implicitly described the field as a physical location at which actors gather and construct the phenomena under study. Yet, modern-day organising not only unfolds in the physical but also in the virtual. This opens new possibilities also for organisational ethnography. For example, digital data enable ethnographers to follow people's online interactions or to be co-present with a group of people who are physically in a different location (Akemu and Abdelnour 2018; Murthy 2008). Taken to its full extent, we can refer to this mode of ethnographic enquiry as virtual ethnography or netnography (Kozinets 2002). While this type of ethnography becomes increasingly relevant (e.g. for studying pure online phenomena), I would like to direct our attention to a different aspect. In 1995, Marcus argued for the emergence of multi-sited ethnography. He postulated that phenomena are seldom constructed in just one site but across different sites. Thus, if ethnographers intend to understand a phenomenon, they need to follow it across sites, for example, how actors construct an object, story, metaphor or conflict (differently) across multiple sites. While *sites* can refer to physical locations, we can also understand it as the macro (i.e. abstract notions and principles of organising) or micro level (i.e. concrete practices drawing and manifesting broader organising principles) of organising. Hence, if we seek to understand how organisational actors enact modern-day phenomena of organising and IS on both the macro and micro levels, we need to follow their enactment across the sites of the macro or micro level of organising. Since a researcher can only be present at one site, however, digital data, archival records and documents provide us with a great source for tracing a phenomenon across multiple sites (Akemu and Abdelnour 2018; Eberle and Maeder 2016; Murthy 2008). This material, in its own right, tells narratives of field events which ethnographers can utilise in writing tales of the field (Czarniawska 1998; Gubrium and Holstein 1999).

Considering the characteristics and assumptions of the ethnographic approach, I consider it an intuitive and engaging way to study the enactment of a phenomenon in practice. DT is a complex, contextual and empirical phenomenon of organising IS. Hence, given the epistemological assumptions of ethnography to create scientific knowledge by studying phenomena in their naturalistic environment, I found it a

powerful mode of enquiry for studying DT. In ethnography, I saw the possibility to venture beyond mere talk to “where the action is” (Myers 1999), the action that enacts an organisation’s DT. Moreover, my access to the field rendered possible the immersive and lengthy type of fieldwork required for an ethnographic enquiry. Against this backdrop, I considered it an opportunity wasted to not venture to explore the research site’s DT using the immersive fieldwork which defines ethnographies. Jointly, these considerations – the rationale arguments for ethnography which textbooks provide, intuition and my fascination with the field – provided the reasons for my choice of ethnography. In the next section, I will outline my fieldwork at AutoCo.

3.2.2 Empirical Material

“I have endeavored to show that there is no sovereign method for establishing fieldwork truths. It is murky out there and in here” (van Maanen 2011b, p. 138).

The conventions of journals and conferences – mainly the set page limitations (Myers 2009a) – strip from ethnographers the possibility to provide reflective and detailed confessional accounts of their fieldwork (van Maanen 2011b). A notable example in IS research is Schultze’s (2000) “A Confessional Account of an Ethnography About Knowledge Work.” In particular, the confessional writing style adds to demystifying the process of fieldwork and, thus, to the credibility of the presented findings (Klein and Myers 1999; Walsham 1995). In this section, I will therefore observe a reflective and confessional style when describing my fieldwork activities, including hurdles, obstacles and the “murky” parts.

The empirical material, as is typical for ethnographies (Atkinson et al. 2001), stems from extensive fieldwork within a single site (for the description of the research site see 4 Research Site: AutoCo). Prior to the fieldwork, the researcher must negotiate access. In early 2017, when I was writing my research proposal, I set out to study DT in the automotive industry. My interest in the automotive industry’s DT is rooted in my previous work experiences. From 2011 to 2015, I worked at AutoCo as a bachelor and master student. During this time, I conducted more than seven internships at the company’s IT and HR departments. These internships made me familiar with the organisation’s structure and the industry in general. Moreover, I turned to the automotive industry as it is an important economical pillar of the European Union and in particular Germany which, in 2017, faced problems from the rising Diesel scandal. This scandal put pressure on the car manufacturers about their choice of vehicles’ future powertrains, both legal and public pressure. In addition, shifts in mobility (e.g. ride-hailing or -sharing) and technological advancements (e.g. autonomous driving) started challenging and transforming their business model. Industry reports portrayed the automotive industry as pressured to engage in its DT

(Probst et al. 2017; World Economic Forum 2016). Therefore, I considered companies in the automotive industry as suitable sites for studying the enactment of DT.

From the beginning, I planned my research to be empirical. Yet, before negotiating access to a car manufacturer, I screened for PhD funding opportunities. In this screening process, I stumbled upon a job tender at AutoCo in April 2017. The company's internal organisational development unit was looking for a fixed-term PhD candidate to split work (50:50) as an internal consultant and a researcher on AutoCo's DT. The job tender outlined that the unit wished to understand the company's DT process. The position was set to start in July 2017 with a fixed term of three years from 2107 to June 2020. Since it was a salaried position, it offered both funding and access to an incumbent automotive company undergoing DT. Hence, I submitted my application. After completing a phone interview and a day-long session at the assessment centre, I received a phone call in which the unit's manager offered me the position. I accepted it gladly. Figure 5 illustrates the timeline of my fieldwork including negotiation of access and constructing as well as collecting empirical material.

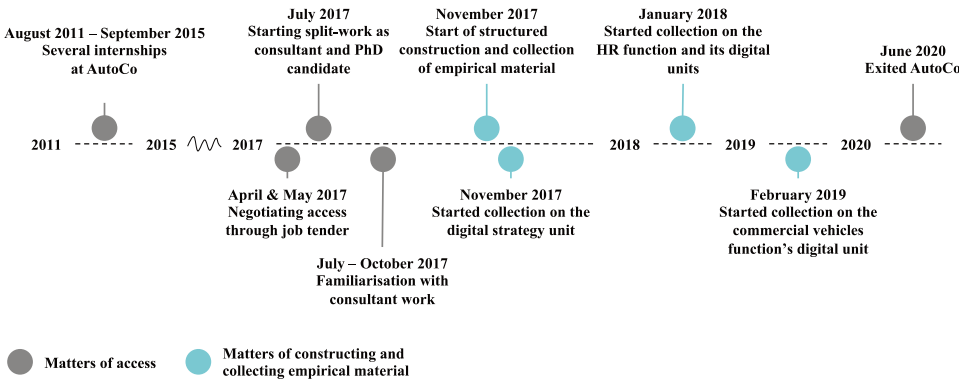


Figure 5. Timeline outlining activities for negotiating access to AutoCo as well as constructing and collecting empirical materials in the field

The fieldwork commenced with the position at AutoCo in July 2017. Entering the field, I first focused on familiarising myself with my consultant work obligations. That is, the agreement with AutoCo's organisational development unit asked me to observe the same tasks and responsibilities as my colleagues. Since I was not familiar with these tasks, I spend the first four months acclimating myself to this new role. During this onboarding time, I shadowed my peers during their work. This work involved interviews with customers (e.g. team or department managers) for whom my peers designed and rolled out change programmes or conducted strategy workshops (e.g. moderating workshops, steering the follow-up process). Once my manager deemed me competent, I started this consultant work independently, or, for

larger projects, jointly with colleagues. My entrance into the field had thus three peculiarities which influenced my field identity. First, opposed to ethnographers who enter the field by sanction of a gatekeeper to partake only by observing, I entered the field on grounds of a tendered position. This made me a “new colleague” rather than a research emissary or intruder. Second, my consultant work obligations put me on the school bench. I had to run through the usual onboarding process, asking my colleagues for advice and help. Yet, I asked them not for the sake of my research but for me to be able to share in their tasks – and the difficulties these tasks involved. This forged my field identity as one of them rather than “me and them” (Myers 2009b). Third, my familiarity with AutoCo smoothened my thrownness at the field (Chughtai and Myers 2017).

After the onboarding, I perked up my ears and adjusted my eyes to AutoCo’s DT activities. That is, I started to collect and construct empirical material through participant observations (Emerson et al. 2001; Ingold 2014). Here, I refer to collected and constructed empirical material, because I constructed empirical material when compiling field notes based on my observations (Emerson et al. 2001), but I also collected material which AutoCo (and its members) produced (e.g. archival records, digital data etc.) (Akemu and Abdelnour 2018; Murthy 2008). Compiling field notes, I sought to follow Schultze’s (2000) template. However, I must admit that I followed it loosely. Combining consultant and research work often exerts time pressure on either task. As a consequence, I often found myself confronted with difficult decisions. I had to weigh whether I could neglect consultant work for research work or vice versa. This trade-off always involved reflecting on my access to and position in the field. While my formal access was secured with my split-work contract, I had to continuously negotiate my informal access with my manager at AutoCo. In Czarniawska’s words, “I argue, however, that seeking access continues throughout the whole study, that there is no such felicitous moment when the study can continue without hindrance” (1998, p. 33). The continuous negotiation of access was – so it seemed – a matter of give (consultant work) and take (time for research).

In practice, this meant that my participant observations depended on the activities in the field. On some days, I had to focus on my consultant work leaving little opportunity for compiling field notes. On other days, I participated in meetings, ideation events, strategy summits or workshops or met with organisational members who engaged in AutoCo’s DT activities. My active role facilitated access to these activities and organisational members. Not being a passive observer but an employee and colleague, my peers invited or hinted for me to participate in the respective DT activities or connected me with key actors. Occasionally, they asked for my opinion on matters of DT or requested that I give a talk on my research. This interaction, sharing organisational members’ interest in DT and being transparent about my studies, helped me establish a position of rapport and openness with the people in the

field. This position provided me access to DT activities and organisational members who may have been less willing to engage, if I had been a passive observer only asking without giving. Sharing an anecdote, after a set of informal conversations with one interviewee, I asked for a formal interview. While we had previously discussed a particular issue, I remained comparably passive during the formal interview until the interviewee prompted me on whether I was going to comment and share my view. Despite these perks of my active role in the field, I also acknowledge that my work obligations placed time constraints on my research; it particularly, limited my writing of field notes. Thus, I moved to compiling field notes in a style suitable to the conditions of my fieldwork.

Whenever my opportunity to compile field notes was limited, I sought to store my observations as “head notes” (Schultze 2000). Writing field notes, I – on the spot – jotted down notes (Emerson et al. 2001). These jottings sometimes were mere words or snippets of sentences which most likely made little sense to others but were aimed at helping me remember so that I could afterwards elaborate or recollect the experience (Jarzabkowski et al. 2014). As my note writing improved, I developed a set of conventions. I started putting indirect quotations within apostrophes and verbatim ones in double quotation marks. While I kept descriptive accounts in non-italic font, I highlighted on the fly interpretations in italics (for exemplary field notes see Appendix 1). For compiling and storing my field notes, I relied on a digital notebook accessible on both smartphone and PC. However, when in meetings, I used pen and paper. I found that bystanders pay little attention to a person eagerly typing on their smartphone when at an event (the person could be replying to a work email), but become quite suspicious, if one walks around with a notebook containing scribbles and notes on the event, ongoing actions and talk. Yet, in meetings, the reception was flipped; I had the impression that attendees considered pen and paper as signalling attention, while a smartphone (or laptop) meant disinterest. In my digital notebook, I kept different sets of notes, including field notes, memos and analytical notes (Emerson et al. 2001). What resulted is a vast body of field notes containing snippets, starts and ends of narratives, anecdotes, the gist of informal conversations, chance meetings and bits and pieces of unconnected matters.

As suggested for interpretive studies (Klein and Myers 1999; Walsham 1995), I sought to maintain openness to my fieldwork, i.e. even shift the focus of my study if an interesting observation emerged. To achieve this openness, I soon began venturing beyond the confines of the internal organisational development unit. After all, I intended to study AutoCo’s DT at the macro and micro levels. Hence, I sought to trace both macro- and micro-level activities. For this, I closely followed AutoCo’s external and internal news, digital units’ DT activities and the company’s enterprise social media (e.g. digital units’ online presence as well as online communities on DT). Collecting these archival records and digital data enabled me to trace

organisational stories of macro-level activities (e.g. strategic decisions or stories of strategy implementation) to related micro-level activities. This was both a methodological and pragmatic choice: methodological because it enabled me to follow the enactment of DT across different sites within AutoCo (Marcus 1995) and pragmatic, because it enabled me to collect naturalistic and insightful field data beyond my own field notes, especially at times when my consultant work took the upper hand.

Informal interviews most often occurred by happenstance at the coffee table, during breaks or at ideation and strategy events. In these insightful moments of conversation, I decided against audio recording to avoid risking the rapport I had established or raising suspicion about my presence. To me, it seemed inappropriate to pull out the audio recorder (or smartphone) once a colleague or organisational member started talking about something interesting. However, whenever I enquired for my research purpose, I made my dual role of a consultant and researcher explicit. That is, when I asked research related questions, I shared that my research interest was rooted in a method which is based on notes taken on observations and conversations. My conversation partners responded to my role and research with interest and curiosity. In addition, within my team and department, I shared my research interest and methodology during my introductory presentation as well as at subsequent meetings. Shortly after an informal interview (or at the soonest available opportunity), I captured the conversation in field notes (Myers 1999). If time was pressing, I sometimes recorded my memory of these interviews in a voice memo. However, I also organised formal interviews when a meeting by chance was unlikely. On these occasions, I prepared a mind map of themes that I wished to discuss but refrained from a semi-structured interview guide. Even in these formal interview situations, I sought to establish an informal setting to arrange the conversation as if two people interested in AutoCo's DT were sitting and talking over a cup of tea or coffee. Nonetheless, for these formally arranged interviews, I asked both the AutoCo's workers council and the interviewees for permission and informed consent to audio record and transcribe these interviews.

Hence, in my fieldwork, I combined the construction of field notes with collecting archival records and digital data. With this combination of empirical material, I sought to trace and reconstruct the enactment of AutoCo's DT across sites of macro- and micro-level activities. However, throughout my time in the field, I have observed a "researching up" perspective (Eberle and Maeder 2016). That is, my observations and data reconstruct the phenomenon of AutoCo's DT from the perspective of an organisational member on the hierarchical and functional level of an employee. This does, however, not express sympathy with a specific group of AutoCo's employees but emphasises that I constructed my empirical material without privileged access to macro-level activities that occurred behind the closed doors of AutoCo's senior and executive management. Put differently, while I shared the tasks, office rooms and

coffee kitchen with my peers at AutoCo, I also shared their respective access to and distance from the company's management decisions. As result, I caught snippets of stories on these decisions and their underlying rationale via middle managers or peers. In addition to face-to-face storytelling, I relied on my observations of senior managers' talks at strategy summits, ideation events or on external and internal news and enterprise social media postings. While the empirical material on macro-level activities may thus be critically assessed in respect to the backdrop of my research perspective, it resembles the material that any employee at AutoCo could obtain to understand the company's DT activities.

My fieldwork ended in June 2020 with my work contract ending. While the end date was set at the start, I also felt that I had collected and constructed sufficient empirical material for many more tales of the field than the ones underlying this dissertation. Moreover, AutoCo had entered a phase of economical strain toward the end of 2019, intensified by the pandemic that hit in early 2020. Consequently, the company's management had altered its strategy and ceased many of the DT activities (article III briefly reports this). When exiting the field, my colleagues at AutoCo presented me with a gift, a farewell card and many personal messages. They expressed their thanks for my collaborative attitude, commitment to knowledge transfer and the efforts I had exerted in my consultant work and as a contributor to the company. Their farewell signalled to me that, during my time in the field, I was not a flower on the wall – an outside observer, or an intruder suspected of eavesdropping – but a peer.

3.2.3 Empirical Analysis

When in the field, my fascination with the unique and emergent nature of AutoCo's DT resulted in five articles. At first sight, these articles may seem like standalones. However, they are tied together by the means of obtaining the empirical material, the research site and the broader phenomenon under scrutiny. While each article has its own focal site within AutoCo, i.e. features its own unit of analysis, I understand them as jointly providing a multi-sited approach (Marcus 1995) for understanding AutoCo's organisational DT. Individually, each article zooms in on the DT activities within its focal site; combined, the articles offer a collage, the possibility to zoom out from each article's specific site to focus on the organisation's DT enacted across these sites. This zooming in and out was central to the empirical analysis underlying this treatise. It enabled me to unpack the relation between the macro- and micro-level activities within and across the different focal sites and how these – in an interplay – co-enact the company's DT. In this section, I first outline my empirical analysis for the five articles. Subsequently, I provide details on how I extended this

analysis to distil the analytical concepts of framing and concretising which aim to explain how macro- and micro-level activities co-enact DT.

Entering the field, I was overwhelmed with the noise: the many interesting, relevant, and initially surprising things happening at each corner. Confronted with this noise, I found value in what Van Maanen (2011b) described as “realist tales” beyond the acceptance of the associated writing conventions within the IS field (as mentioned above). Realist tales are theory informed. They provide an account of the field through the lens of a specific theory. The theories I selected thus informed my analysis of the empirical material. Yet, I retained openness to the field selecting and adjusting my theoretical angles through an iterative process of relating my empirical material to existing literature. Once I had selected an angle, the theory informed nature of realist tales provided me focus for both constructing and analysing my empirical material.

Analysis of the empirical material was continuously part of my fieldwork. Already in the field, I started unpacking my material. I sought to summarise my material, categorise my notes and observations and sort the archival records and digital data by focal sites (i.e. units of analysis) or by organisational processes, or by the underlying phenomenon (which I suspected at the time). In this process, I zoomed in on focal sites or processes to grasp what was going on, to then zoomed out and related these to the bigger picture. For this, I turned to theories which I found interesting, fascinating and telling for what I thought to observe in the field. For example, when writing article I, I had recently observed multiple ideation events at AutoCo. Yet, the conception of these events as improvisation only emerged as I encountered improvisation theory. That is, in parallel to my fieldwork, I engaged with existing literature and theories to relate my observations to. In the case of article I especially, improvisation theory’s concept of minimal structure spoke to my field experience. Relating my observations to theoretical descriptions and back, I identified blind spots both in theory and in my fieldwork. Considering these blind spots as opportunities for theorising, I redirected and narrowed my fieldwork – I zoomed in on a specific activity – to collect respective empirical material. Thus, while my fieldwork drove my choices of theory, my selection of certain types of theories also drove my fieldwork. I therefore tend to agree with Van Maanen’s statement that “theory choices (the rabbits we pull out of our hats) rest as much on taste as on fit” (2011a, p. 223). Hence, already in the field, I structured, interpreted and analysed my empirical material iteratively and on the fly. In addition, I “shared my experiences and my initial interpretations of events with people outside the field” (Schultze 2000, p. 11f.).

My fieldwork brought to my attention many interesting observations. When any of these struck me as relevant to my research questions, I identified and scoped the portion of empirical material (i.e. material on a focal site forming a unit of analysis) that constructed the suspected phenomenon. This means that every now and then, I

stepped out from the field to pause, and to zoom in on a specific phenomenon for writing the underlying articles. Dissecting these portions of material (and also during fieldwork), I followed guidance on qualitative data analysis when constructing diagrams, conceptual maps or tabulations structuring and relating my empirical material as well as connecting first-level concepts to theoretical descriptions (Miles and Huberman 1994). To facilitate these analytical tasks, I used the NVivo software package. It afforded me with the potential to create codes for first-level concepts, cross-compare and integrate these first-level concepts, and create diagrams, concept maps and matrices of my codes. However, I mostly relied on NVivo for my initial coding of interview transcripts, documents and field notes as well as exploring these codes (see Appendix 2). While using NVivo facilitated coding first-order concepts, I felt that its action potentials and constraints limited my possibilities to then work with these codes. Thus, once I had the first-order concepts coded, I used sticky notes, whiteboard scribbles and spreadsheets to organise my thoughts on the first-order concepts, their interrelation and link to theoretical descriptions. Analysis then proceeded through several iterations in which I refined the initial codes, their relations and tested different visualisations. Another important aspect in these iterations was writing and rewriting. Through writing, I forced myself to explicate my thoughts or rather to think carefully – writing as thinking. Revisiting my write-ups, I could reveal fallacies, missing links or explanations and, thus, improve my analysis stepwise. For the same purpose, I also shared these write-ups with my PhD supervisors and co-authors. My analytical activities therefore involved dedicated software packages (i.e. NVivo) but also techniques and tools free of any software’s affordances.

Besides these formal steps, I sometimes conceived interpretations of my observations in the most unexpected situations, for example, while commuting and during sports or other leisure activities. When my mind wandered away from the field, I conceived sudden insights. However, I found that these sudden conceptions – these *geistesblitz* (en: sudden inspirations) – could be misleading. In these moments, I used my smartphone to record my thoughts in my digital notebook or record a voice memo. Afterwards, I then revisited these notes and voice memos to connect them to my empirical data, head notes and prior literature. What, at first, seemed creative, novel and ground-breaking often turned out to be known, dull or irrelevant. The analysis was thus a piecemeal process of “fieldwork, headwork, and textwork” (van Maanen 2011a) through which I sought to distil the essence of my observations and thus get to the core of the emerging issues.

Organising my analysis and findings in textwork, I followed a narrative approach (Czarniawska 1997, 1998). Narratives feature an initial state, an actor, event or action and an end state. However, merely listing these elements lacks the plot, the strings which connect them into a meaningful whole. Chronology is the simplest string for weaving a narrative. I employed the narrative approach to analyse my

empirical material in two ways. First, I sought to identify the actors, activities, beginning and end of my observations to then mould and compile them together in a truthful reconstruction of the field events in order to convey a possible interpretation of these events against the backdrop of a selected theory (Czarniawska 1998; van Maanen 2011b). Second, studying archival records (e.g. press releases, internal news and documents) and digital data, I sought to dissect how these materials constructed narratives of the field in their own right (Cortazzi 2001; Linders 2008). One of the great advantages of archival records and digital data is their natural occurrence; they exist without any researcher intervention. Further, organisational members produce such records and data in their daily operations. As such, they construct meaning of and on their organising (Silverman 2014). Thus, in this second approach, I refrained from using the collected archival and digital data to cross-check facts but – in a constructivist tradition – endeavoured to understand the reality they constructed (Linders 2008; Prior 2008). For example, for article II, I tabulated all actors, actions and end states in AutoCo’s documents on its digital workplace transformation. I then integrated the actors across the different documents (e.g. removing duplicates). Lastly, I connected the resulting story elements to deinstitutionalisation in order to identify how the documents’ narratives constructed factors for triggering erosion of workplace practices.

Combining these approaches, I engaged in a laborious process of writing, rewriting, and re-rewriting until I arrived at reconstructions of the studied organisational activities for AutoCo’s DT which foregrounded the essence of my observations. Depending on the focal matter, I employed one or a combination of the three writing strategies – vignettes, composite narratives and processual narratives – to convincingly present my interpretations and ethnographic material (Jarzabkowski et al. 2014). The resulting narratives thus stemmed as much from my field experience (i.e. field notes and head notes) as from the analysed archival records and digital data. Moreover, I guarantee that, while they are “tales of the field,” they provide as truthful an account as possible. Validating these accounts, I offered them and my conclusions in presentations at AutoCo, and shared the five articles with my managers, colleagues and informants whom I had interviewed. Since my managers had to approve the articles’ publication, this was obligatory. Yet, I also used these opportunities to validate my observations and interpretations with those of field members. Table 9 outlines the underlying articles’ focal sites within AutoCo, the empirical material as well as means of analysis and presentation.

Table 9. Presented by article: focal sites, empirical material and means of analysis and presentation

Article	Focal sites	Empirical Material	Means of Analysis and Presentation
Article I	Digital unit at the corporate strategy level and its ideation events	<ul style="list-style-type: none"> • Field notes • Informal interviews • Digital data (interactions and posts on AutoCo's enterprise social media) • Archival records (e.g. strategy documents, internal news etc.) 	<ul style="list-style-type: none"> • Narrative approach • Vignettes
Article II	Central DT programme, internal organisational development unit, and employees in other units	<ul style="list-style-type: none"> • Field notes • Informal interviews • Digital data (interactions and posts on AutoCo's enterprise social media) • Archival records (e.g. strategy documents, internal news etc.) 	<ul style="list-style-type: none"> • Narrative approach • Vignettes and processual narrative
Article III	Two digital units within AutoCo's HR function and one digital unit within the commercial vehicles function	<ul style="list-style-type: none"> • Field notes • Informal interviews • 14 formal interviews with managers (5) and employees (3) • Digital data • Archival records (e.g. strategy documents, press releases, internal news etc.) 	<ul style="list-style-type: none"> • Narrative approach • Composite and processual narratives
Articles IV and V	Digital unit at the corporate level and its promotion of digital collaboration at AutoCo	<ul style="list-style-type: none"> • Field notes • Informal interviews • Digital data 	<ul style="list-style-type: none"> • Narrative approach • Processual narrative

For this treatise, I extended my empirical analysis to investigate the observations presented within the five articles as a whole. Each article offers a glimpse of specific focal sites and macro- or micro-level activities situated within the three areas of concern (DT strategy, organisational changes and digital infrastructures). Yet, none outlines – neither empirically nor conceptually – how these activities co-enact AutoCo's DT. Exploring this question, I took an iterative process of zooming in and out which can be structured into four phases.

First, I zoomed in on the five articles' narratives to categorise the observed activities as macro- or micro-level activities. Comparing them to my working definition of such activities, I found that AutoCo's strategic change programmes reflected macro-level activities as they outlined strategic objectives, principles for future organising and spanned AutoCo's entire organisation. In contrast, the observed digital

units' activities appeared to illustrate concrete actions of organising specific to a local function or unit, and thus, I categorised them as micro-level activities. The first phase consequently resulted in sets of macro- and micro-level activities.

Second, I zoomed out to broadly view and compare the identified macro- and micro-level activities within and across the articles' focal sites as well as the three areas of concern. This zooming out constructed a collage of focal sites featuring different macro- and micro-level activities which seemed to jointly enact AutoCo's DT. For example, trying to understand the enactment of DT strategy through ideation events, I found that AutoCo's macro-level strategy defined the topics for the micro-level ideation at these events. At the same time, the micro-level activities seemed to manifest the macro-level strategy turning the latter into concrete ideas and implemented solutions. In conceptualising this observation, I refer to this relation between macro- and micro-level activities as framing and concretising. While macro-level activities seemed to frame DT, micro-level activities appeared to concretise it.

- *Framing*: Outlining the broader rules and resources for DT.
- *Concretising*: Manifesting DT in operational processes and actions.

Third, I zoomed back in on the activities which framed and concretised DT to dissect the mechanisms through which macro-level activities frame and micro-level activities concretised it. This zooming in revealed that AutoCo's strategic change programmes allocated resources (e.g. time or budget) and created structures supporting micro-level activities. For example, AutoCo established dedicated digital units or organised ideation events and DT summits. I refer to this mechanism as spacing. Besides spacing, my observations revealed a second mechanism within which macro-level activities define goals, plans and visions for AutoCo's DT. I refer to this mechanism as projecting. Similarly, I analysed the observed micro-level activities. Studying ideation events and digital units, I found that they identified and suggested specific ideas for DT. Since these ideas only become implemented by management approval, I refer to this mechanism as proposing. If management approves an idea, digital units (or their idea owners) implement it, producing observable outcomes of DT (e.g. a new digital service). I refer to this mechanism as realising. Thus, the third phase revealed a pair of mechanisms for macro-level activities' framing and micro-level activities' concretising. Macro-level activities frame through spacing and projecting, while micro-level activities concretise through proposing and realising:

- *Spacing*: Providing resources and organisational structures (e.g. time and budget) for DT.
- *Projecting*: Setting visions and plans for DT.
- *Proposing*: Identifying and suggesting ideas for implementing DT.
- *Realising*: Implementing observable outcomes of DT.

Although stemming from my observations, these conceptions were analytical. That is, they were not readily observable entities in AutoCo's organisational life awaiting discovery; rather, they emerged from my empirical analysis. This bears out that the empirically observed activities underlying these conceptions were not clear-cut but indistinct. When micro-level activities, i.e. concrete practices at the operational level, manifest DT, they draw as much on broader rules as they can become part of these rules of DT in the form of an epitome, blueprint or best practice offering organising principles for future micro-level activities. Moreover, strategy programmes and the like emerge from actors practicing strategy, thus from concrete practices (Whittington 2014). However, I found that these conceptions provided powerful analytical devices to grasp and explain how macro- and micro-level activities enact DT.

4 Research Site: AutoCo

The empirical material underlying this treatise stems from an ethnography at a large car manufacturer (AutoCo). Analysing this material, I wrote five articles describing my research on different focal sites within AutoCo. Locally, these focal sites featured dissimilar characteristics and micro-level activities which I considered in the respective articles. Being part of AutoCo, these focal sites shared, however, the company's organisational context, i.e. its history, culture, product, market, strategy; the macro-level activities encapsulating the shared rationale for organising in AutoCo, but also its DT. In this chapter, I therefore first outline AutoCo and its organisational context. Second, I explain AutoCo's DT process at the macro level and situate the studied focal sites within this macro-level process.

4.1 AutoCo: An Incumbent Car Manufacturer

AutoCo (a pseudonym) is a large car manufacturer with a long history. Its foundation dates to the late nineteenth century. In fact, its founders have contributed tremendously to the car's invention. The company takes great pride in its history and strives for perfection. Since its founding, AutoCo has grown into a globally operating manufacturer of original equipment. It has multiple manufacturing sites and office locations in Germany and Europe and elsewhere around the world, rendering AutoCo a truly multi-sited corporation. In terms of numbers, AutoCo, in 2019, had a revenue of more than €100 billion and a market share of over 5% (of all units sold) in the European Union, and it employed more than 200,000 employees. With AutoCo founded and based in Germany, the main share of these employees works in the company's German locations. Most employees at these locations (the largest share is engineers), as typical for German organisations, have worked for AutoCo since their graduation and most likely will so until their retirement. Indeed, AutoCo often ranks high in employer evaluations and many engineering graduates desire to work for the car manufacturer. Besides its own employees, its operations create jobs within its entire global supply network. This makes the car manufacturer one of the most important employers in Germany and Europe, and its revenue and market share position it as an incumbent in its industry and market.

Regardless of its global and multi-sited operation, AutoCo's organisational life aligns with a centralised structure. Achieving high-quality engineering requires alignment of technical decisions. Employees thus refrain from making decisions swiftly but run them by their superiors. This has engendered a command-and-control culture which manifests in its centralised structure. Almost all business functions (e.g. product development, corporate strategy, HR or IT) operate from AutoCo's headquarters location. They plan, decide and orchestrate both the central and decentral operation of business processes through defining process standards and policies. Further, support functions such as HR or IT offer shared services to the peripheral HR and IT units (i.e. units at non-headquarters locations; in Germany alone, AutoCo has more than 100 locations). Through this central structure, AutoCo seeks to establish standardisation, scalability and cost reduction. Yet, it also entails that the peripheral HR and IT units balance their operations between central standard processes and local exceptions. For example, every location has its own worker council issuing worker agreements valid only within a worker council's jurisdiction. The peripheral HR units then need to adjust their processes to accommodate these agreements. Similarly, the peripheral IT units can implement basic solutions and changes but rely on the central support function to deliver shared services and adjust standards or policies. This centralised structure ensures that organisational life and decision-making at AutoCo is strongly aligned with the company's senior management at its headquarters. However, accommodating for its different brands, products and services, it organises itself in three divisions.

AutoCo comprises three divisions: passenger cars, commercial vehicles and financial services. These divisions oversee different products sold under a vast portfolio of brands. Although AutoCo positions its brands for different markets, market segments and core offerings, it takes pride in one particular brand. This brand targets the premium segment. Since its inception, it symbolises quality, design, aesthetic and a loving passion for utmost perfection in engineering. Its symbol communicates its founders' vision of offering mobility at land, sea and in the sky. This vision originally saw AutoCo primarily as a manufacturer of combustion engines for use in automobiles, ships and airplanes. However, over time, AutoCo emerged as an original equipment manufacturer for cars, lorries and busses. Not only the company's vision, also its product portfolio evolved. Currently, AutoCo offers a wide range of multiple car models.¹ This range of models has changed over time, both vertically and horizontally. Vertically, AutoCo introduced new base models at the higher and

¹ To simplify, I have only outlined the differences amongst AutoCo's different car models. A similar differentiation could be described for the different makes of lorries and busses, albeit market demands and, thus, the grounds for different makes differ between passenger cars and commercial vehicles.

lower price ranges in the premium segment. These base models differ in car body, design, size (e.g. length, car boot volume, leg space, passenger cabin etc.), motorisation and available features. Horizontally, AutoCo offers different styles for each base model. These variations can be a coupe, saloon, estate car or cabriolet. AutoCo designs each of these models and their variations to address a specific market and segment. Developing these models, AutoCo's engineers produced many inventions which the company narrates as milestones in the development of the car. In its own museum, it outlines them as having significantly improved passenger and road safety and passenger comfort, but also engine efficiency and durability. Organisational members narrate this history as an important aspect of AutoCo's identity. Indeed, looking back, AutoCo and its members take pride in their organisation and its achievements in engineering cars for individual mobility.

Over the course of history, however, the concept of mobility has evolved. Before the car, horses and coaches provided people with the means for their mobility. While horses were for the wealthy, trains already offered public transport to the masses (and faster long distance travelling to the wealthy). In this equation, the car replaced horses and coaches for individual mobility. Soon, it reached the meaning of a status symbol. In the early twentieth century, the Taylorisation of car production and assembly lines enabled the mass production of cars and the achieved scaling effects which entailed decreasing costs. At the same time, people's earnings rose. Gradually, cars became affordable for a larger share of the society. It eventually became the symbol of individual mobility. Yet, at the start of the twentieth-first century, car manufacturers observed a decline amongst youth and adults desiring to possess their own car or, when living in urban areas, obtain a driver license. Simultaneously, public debate on climate change and car emissions raised individuals' awareness of their ecological footprint. New digital platforms and services were launched (e.g. Uber, Blablacar or Lyft) offering alternative options for mobility. AutoCo's management observed the shift in status symbols, public debate on climate change, and new digital services as jointly altering the concept of mobility. Seeking to respond to this evolution, AutoCo started developing its own digital products and services as well as infusing its cars with digital technology. However, the craft of designing and engineering cars can be demarcated from designing digital products or services in terms of three major factors.

First, car manufacturing is an asset-heavy business. Car manufacturers require high investments in materials and components which flow into assembling cars. Typically, they do not develop and build all these components themselves but contract suppliers to deliver, e.g. fully assembled dashboards including all the electronics, switches, displays, and tachometers that make up a car's dashboard instruments. While this reduces vertical integration, it creates dependencies on suppliers, legal obligations and payables. The cars' materials and components constitute, however,

only one part of the cars' assembly. The other part is machinery used to move all the components into their designated places. This machinery ranges from handheld tools to long assembly lines, paint shops and multiple welding robots for body construction. In particular, the latter three feature long amortisation cycles. Thus, car manufacturers typically do not exchange or renew their production facilities every year but only after long cycles. While this ensures amortisation of their investments, it can constrain their ability to leverage new machinery or technologies' advantages for production. Hence, while digital products require comparatively little investment in resources, manufacturing cars involves significant financial resources in components and machinery. This means that older machinery can confine car manufacturers' possibilities in the production processes.

Second, cars have longer product life cycles compared with the hardware underlying digital products or services. At AutoCo, Car models have a product life cycle of roughly seven years. That is, every seventh year the company releases a completely new version of a model. Over those seven years, the model experiences one "face lift." A face lift can mean smaller changes to a car model's interior and exterior design (e.g. a different looking radiator grill) as well as improved engines (e.g. better efficiency). Yet, the model's intrinsic features, e.g. its underlying vehicle architecture, mostly remain the same. Similar to the first factor, these long product life cycles depend on the car models' amortisation time. The investments into a car model's development amortise only over an extended period. In contrast, we can see, e.g. smartphone manufacturers releasing new hardware every year. With regular releases of better hardware (e.g. more computing power), the smartphone manufacturers provide grounds for new software applications or features. However, software developed for cars is bound to the hardware constraints from previous years. Thus, cars' long product life cycle confines possible digital products and services to the possibilities of seven- (or three-) year-old hardware. Hence, the development of digital products or services integrated into cars must accommodate for the cars' product life cycle.

Third, upfront planning and waterfall models are typical for developing cars. At AutoCo, the release of a new model is planned upfront and follows a recurring timeline (i.e. a similar timeline applies for every new model). This timeline sets milestones for first design concepts, prototypes, field testing and the final ramp-up of the model's production. These milestones build up to the final introduction date. After this date, AutoCo only undertakes small changes to improve production and eliminate quality issues. Thus, once a car model – the product – is ready and shippable, it receives no significant updates in shape, form or features. Moreover, the development occurs behind closed doors. Whereas software engineers build applications through quick and short cyclic releases to customers, engineers develop cars following a waterfall model only releasing the final make. While this stems in part from

the unlike materiality of software and cars, it illustrates the differences in developing cars compared with digital products or services and how these differences manifest in differing product development approaches.

These three factors, namely, car manufacturing as an asset-heavy industry, dissimilar product life cycles and differing product development approaches, illustrate the otherness of developing cars compared with digital products or services. Yet, facing the changing concept of mobility, new market entrants (e.g. Tesla) and new business models (e.g. ride-hailing services such as Uber, Didi or Lyft), AutoCo's management realised a need to blend these ways of organising.

4.2 Digital Transformation at AutoCo

Recognising a need to respond to digital disruptions, AutoCo's board of management launched two strategic change programmes framing the company's DT process. As part of these programmes, AutoCo also established multiple digital units for different organisational functions (e.g. strategy, commercial vehicles, or HR). This chapter first describes AutoCo's DT process along its two central strategic change programmes: DigiCar and Auto2020 (both pseudonyms). It then delves into multiple digital units and their activities for AutoCo's DT.

4.2.1 AutoCo's Digital Transformation Programmes

After the financial crisis in 2008, AutoCo experienced its most successful business years. Recovering strongly, the company exceeded its sales record for units sold in multiple consecutive years. During these years, it achieved its strategic goal of becoming the number one car manufacturer in the premium segment. However, AutoCo's management also perceived pressure from digital disruptions and other technological shifts (e.g. autonomous driving, electric powertrains) which had started to challenge the automotive industry. The company's board of management positioned these challenges as its rationale for kickstarting the car manufacturer's DT process in 2016. Hence, at a time, when AutoCo's sales figures were on record highs, its management launched two strategic programmes for its DT.

“[...] one might wonder why a company should change when it's already doing so well. In the first place, I believe that every company can become better. In the second, the framework conditions are changing. New competitors are demanding a new spirit of cooperation. New technologies are requiring new skills. And a new generation of talented young people is calling for a new corporate culture.”
(AutoCo's CEO at the annual shareholder meeting in 2017)

The two programmes framed different visions for AutoCo's DT. The first programme – DigiCar – projected new value offerings. The second – Auto2020 – outlined a transformation for its organisational culture, leadership style and internal processes. DigiCar set the goal to infuse AutoCo's cars with digital solutions to shift its value proposition toward connected, autonomous, shared and electric vehicles as well as digital services. Thus, it set its focus on AutoCo's product portfolio. Spacing for DigiCar, AutoCo established a new unit in a separate organisational structure next to its product development function. For this new unit, it hired talents both internally and externally with a focus on young graduates with a background in software engineering. The second programme, Auto2020, sought to improve internal collaboration and, by this, bolster innovation. For this, Auto2020 set new principles for AutoCo's organisational culture. These principles addressed the company's leadership culture, internal collaboration and employees' development paths. They encapsulated assumptions about and a vision for the kind of organisational culture required to master the company's DT. Jointly, these programmes, and in particular Auto2020 with its internal focus, generated a euphoric mood amongst AutoCo's members concerning the company's DT. The following vignette from a central DT summit illustrates this euphoric mood.

The DT summit takes place in an old factory building near AutoCo's headquarters. It is a warm and humid summer day. Most people are dressed rather casually. Some employees even wear shorts, quite the opposite of the usually formal business dress at AutoCo. When entering the building, it is quite gloomy. The ceilings are high with almost no windows. Most of the light comes from artificial sources. The light from those offers a green touch, certainly not a coincidence given the summit's sustainability theme. With fences, curtains, boxes and carpets, the central unit has set up stalls for different exhibitors. These are not external exhibitors but, e.g. intrapreneurs, internal digital units or community managers on the enterprise social media. One person talks about eSports and how AutoCo's internal sports club, which offers sports and training for occupational health, now has a division for it. At one stall, the group from the HR ideation summit presents their idea for a translation service knowledgeable in AutoCo specific vernacular. The place is buzzing. In a call to all employees, the digital strategy unit had invited everyone interested to sign up. To get here, employees who wished to join had to fill in an online form. Selection was, however, random. Once the selection was announced on AutoCo's enterprise social media, many employees who were not selected posted questions for additional slots, i.e. to invite more employees to the event, or to be put on a waiting list in case somebody who had been selected could not come. The event now hosts roughly 1,000 employees. They come from different functions, departments and teams. Now,

these 1,000 employees flock from stall to stall and between different stages. On these stages, keynote speakers talk about AutoCo's DigiCar strategy, Auto2020, the automotive industry and its DT, autonomous driving, or, e.g. the DT challenge in HR. Today's highlight, however, is the CEO's keynote speech on the main stage. The CEO is set to come on stage in the evening. When it is time, it seems that everyone has come to the main stage. There are not enough seats; people stand at the sides and in the back. When he enters the stage, the audience cheers, whistles and claps. Almost everyone grasps their smartphone to record his speech and take photos. He praises the digital unit for organising this summit. Their work was important for orchestrating all the activities for AutoCo's DT and for illustrating that there is a lot happening in this regard. He closes by stressing the importance of founding AutoCo's DT on its employees: "had we [the board of management] decided to give the direction for DT ourselves, we had certainly failed. AutoCo's DT depends on its employees." (Field note; Central DT Summit June 13/06/2018)

The vignette thickly describes one of the many DT summits at AutoCo. Closing with the CEO's speech, the event framed an important characteristic of AutoCo's DT approach: it stands on the shoulders of its employees. For example, while the company's board of management initiated Auto2020, employees proposed its content – the principles. That is, in a series of workshops held around the globe in early 2016, AutoCo's employees discussed the status quo and the requirements for an organisational culture that could successfully handle the company's DT challenges. These workshops resulted in the mentioned set of principles and the notion to implement changes to different business processes via small teams called squads. When AutoCo's board of management approved the principles and squads in mid-2016, each board member announced sponsorship of one of these squads. In total, Auto2020 comprised eight leadership principles and eight squads.

Each squad had a focal topic which AutoCo considered game changers for becoming a mobility service provider. These were topics such as the instalment of a successful incubator for intrapreneurial activities, implementing new career paths for employees, implementing changes to decision-making processes and digital technology. The squad for the last topic (i.e. digital technology) sought to leverage digital technology for internal collaboration by setting two objectives: (1) increase the number of available digital technologies for collaboration, and (2) empower employees to select and access the digital technologies they need. In this vein, it proposed and realised multiple changes to AutoCo's digital infrastructure for collaboration. For example, they proposed replacing the heterogeneous mobile platforms with a single platform to improve connectivity amongst employees, that is, to switch from multiple operating systems to only one operating system for mobile phones and tablets.

Moreover, at the end of 2016, the squad suggested a package of collaboration tools comprising an instant messaging app, a collaboration platform for project teams and a new enterprise social media platform. With the board of management's approval, the squad, jointly with AutoCo's IT function and digital strategy unit, implemented these three tools in 2017. Besides proposing cultivation of AutoCo's installed base, the squad also altered AutoCo's IT policies. According to the squad's goals, every employee should be empowered to select the software they require for their work. Yet, the existing processes required employees to first gain approval from their superior. The squad therefore altered this process, enabling employees to order and request IT equipment without approval (at least up to a certain order amount).

The squads of Auto2020 addressed business processes which spanned the entire organisation. DigiCar, on the other hand, focused on AutoCo's product development and production units. The company's management framed the two programmes as better aligning the car manufacturer's product portfolio and way of organising with the development of digital services and products, both in its internal support functions and its product development. Inspired by the direction which AutoCo's management projected for these two programmes, AutoCo's members, in its support and product functions, founded digital units. These digital units conducted DT activities within and for these functions. Hence, while Auto2020 and DigiCar formed macro-level activities which framed AutoCo's DT, these digital units' activities concretised it at the micro level. Next, I describe in detail the three focal sites which formed the basis of the five articles. Table 10 provides an overview of AutoCo's strategic change programmes and the studied digital units underlying the company's DT process.

Table 10. The studied focal sites, their digital transformation activities' level (macro or micro) and how they underlie AutoCo's digital transformation process

Focal sites	Type	Level of Observed Activities	Description
Auto2020	Strategic change programme	Macro and micro levels	Auto2020 framed AutoCo's digital workplace transformation. The programme was launched in 2016 and set eight leadership principles and eight game changers. These projected the company's future digital workplace with the game changers also proposing and realising changes which they considered key for transforming AutoCo into a digital workplace.
DigiCar	Strategic change programme	Macro level	AutoCo's product strategy was launched in 2016. It framed AutoCo's DT projecting that its cars would become connected and autonomous to enable digital mobility services. Spacing for DigiCar, AutoCo established new organisational structures.
Digital Strategy Unit	Digital unit	Macro and micro levels	The central digital strategy unit was founded in 2012. The unit framed DT assisting function's managers in setting plans for DT but also organised AutoCo's DT summit, ideation events and trainings involving employees, i.e. space for DT activities.
Commercial Vehicles Digital Unit (CVDU)	Digital unit	Micro level	This was the digital unit in AutoCo's commercial vehicle function. It proposed and realised digital solutions for AutoCo's commercial vehicles following tech companies and start-ups' innovation activities. Following DigiCar, it concretises the projected vision of infusing AutoCo's cars with digital.
DT Office HR (DTO HR)	Digital unit	Macro level	This was the central digital unit in AutoCo's HR function framing the HR function's DT projecting strategic direction but also creating space in the form of ideation events within its different divisions.
Divisional Digital Unit at HR	Digital unit	Micro level	The divisional HR digital unit orchestrated the DT activities within its HR division. It organised a network of HR employees who proposed and realised ideas which concretised the HR function's DT.

4.2.2 Digital Strategy Unit

The digital strategy unit emerged in 2012. Back then, it started as a team of two and as a strategic initiative. Its goal was to infuse AutoCo's organisational life and its products with "digital". Over time, until 2017, the initiative grew into a digital strategy unit of four teams and 30 people situated within the company's central corporate strategy unit. As the initiative grew from two people into an entire unit, its goal evolved into making "[AutoCo] the digital leader in the automotive sector" (internal document). For this, the unit's four teams worked under different headings, namely, transform, change, ideate and collaborate.

The *transform* team tracked external technology and business trends. It shared its insights in regular meetings with managers of AutoCo's different functions and their digital units. Moreover, the function managers also shared their current strategic focus for digital technologies and trends. If the transform team identified a technological trend which lay within the focus of multiple functions, it crafted a strategy for best leveraging possible synergies. Further, it involved the company's board of management to create transparency and decide on a shared direction. Eventually, it created a "strategy house" which framed the central objectives for AutoCo's DT.

The *change* team focused on facilitating the change required for AutoCo's DT. Thus, they communicated on matters of DT, shared information on ongoing intrapreneurial topics, new digital products or services developed at AutoCo and organised different event formats (e.g. AutoCo's yearly DT summit). While the transform team focused on framing and projecting DT strategy with AutoCo's management, the change team communicated this framing to facilitate micro-level activities. Specifically, the change team organised AutoCo's DT summit (see vignette in 4.2.1 AutoCo's Digital Transformation Programmes).

The *ideate* team's activities concentrated on spacing and assisting intrapreneurs in developing their ideas into full-fledged business solutions. For this, the ideate team organised external and internal ideation events. The external events focused on young graduates and took the form of hackathons. The internal events built on AutoCo's employees. While the ideate team organised some of the internal ideation events at the corporate level (i.e. all employees can apply to participate), it also facilitated business functions (e.g. marketing, HR or IT) in organising ideation events focusing on their respective operations. Beyond spacing through ideation events, the ideate team managed an online community for intrapreneurs. That is, employees who developed ideas could seek support from the ideate team, e.g. in terms of methods and best practice sharing, but also networking. Thus, the ideate team created space for employees to propose ideas for digital solutions and it assisted them in realising these ideas.

The *collaborate* team observed a wide range of activities. With the goal of bolstering internal collaboration, it framed implementation of new digital collaboration

tools (jointly with the Auto2020 squad on digital technology), an important step for AutoCo's DT. Pushing new digital collaboration tools, the collaborate team took responsibility, alongside IT and the company's communications department, in implementing a new enterprise social media platform at AutoCo. Since the previous platform only afforded the communications department to disseminate news and thus constrained employees' possibilities for interaction, the new enterprise social media platform marked a leap. Being open, employees could create their own communities, comment on others' posts, including posts from AutoCo's communications department or executive and senior managers. Further, they could create their own internal skill and professional profile, share information on their work – and ideas – and find colleagues who may be able to help them. To leverage the platform's action potentials – and that of other digital collaboration tools – the collaborate team organised networking events and virtual collaboration rounds. These aimed at cultural change, i.e. to inspire AutoCo's employees to overcome the artificial boundaries of the company's organisational structure and engage in cross-functional collaboration. In relation to digital collaboration tools, the collaborate team observed another important activity: the collaboration tools compass. With AutoCo implementing several tools, employees have often approached the digital strategy unit asking for guidance in the company's "digital jungle." In response, the collaborate team has created – and maintained – a tool compass on the enterprise social media which facilitated employees in identifying the best tool for a specific use case. Hence, the collaborate team's range of activities frames AutoCo's DT to rely on the use of digital collaboration tools and cultural change to bolstering internal collaboration.

Jointly, the four teams performed the digital strategy unit's activities for AutoCo's DT. Because of their central position in AutoCo's corporate strategy unit, they spanned across the entire organisation, and their activities targeted all three of AutoCo's divisions. In this way, they framed, through spacing and projecting, the car manufacturer's DT. Given its central position and relatively small size, it sought to act as a multiplier to inspire AutoCo's functions, managers and employees to join the company's DT process.

4.2.3 Human Resources Function's Digital Units

AutoCo's HR function aligned its structure with the company's three divisions and their business functions. Therefore, besides a central HR director, each division had its own HR support function which reported to the central HR director. While the central HR function provided shared HR services for standard processes across all three divisions, the divisional HR functions focused on specifics of their respective division. To drive the entire HR function's DT, AutoCo's HR management founded the DT office HR (DTO HR) in October 2017.

The DTO HR was a central unit of AutoCo's HR function and comprised three members. Jointly, they organised ideation events, DT summits and community meetings within AutoCo's HR function. With its foundation in 2017, it kickstarted its activities with an ideation event in March 2018. To this event, it invited all HR employees. In order to participate, employees had to file an application containing their motivation, expertise and a possible idea to transform AutoCo's HR processes. In the end, the DTO HR selected 100 employees. The actual ideation event was co-hosted by AutoCo's digital strategy unit and its ideate team. It resulted in a total of 50 ideas of which the DTO HR uploaded 10 to a virtual idea platform. On this platform, HR employees could then vote for their three favourite ideas. The owners of these three ideas then had the chance to pitch their proposal to AutoCo's HR director and her management team who then decided to provide funding for one of the ideas. For the development of this – and other ideas – the DTO HR founded an HR think tank and incubator. This means that they provided office space for HR employees to retreat from their actual office and develop their ideas. To gain access to this incubator, they had to file an application to the DTO HR. Thus, the DTO HR's activities frame the HR function's DT by spacing (e.g. ideation events, incubator etc.) and projecting (e.g. setting plans and visions for all HR divisions). These activities facilitated HR employees in proposing and realising ideas for their function's DT.

In community meetings, the DTO HR invited members of the divisional digital units. They discussed digital trends in HR and ongoing DT initiatives in the different divisions as well as new ideas. Each divisional HR function had its own digital unit. For example, the HR function providing HR services to AutoCo's car division founded its digital unit in 2018 shortly after the DTO HR's first ideation event. Its core team comprised five members. However, it also established a network of employees from the different HR departments in the car division. These employees acted as contact persons for other employees who had a proposal for a digital solution. Similar to the DTO HR's community meetings, the digital unit regularly invited this network to share, discuss and jointly decide upon proposed ideas. In these meetings, they also decided who, within the network, takes responsibility for realising these ideas. Hence, the divisional HR function's digital unit organised a network of HR employees who engaged in activities concretising the HR function's DT.

To drive its DT, the HR function founded multiple digital units (centrally and in its divisions). These digital units both framed (the central DTO HR) and facilitated in concretising (the divisional HR unit) the HR function's DT. In regular community meetings, the managers and members of the digital units met to discuss technological trends, joint ideation events and ideas which could be of interest for all divisional HR functions. In addition, their joint activities focused on orchestrating the HR function's DT activities.

4.2.4 Commercial Vehicles Function's Digital Unit

In 2016, with AutoCo announcing DigiCar, the commercial vehicles division founded a digital unit (CVDU). Based on a market analysis, the division's management concluded that the mere improvement of their vans' current value proposition (i.e. engine efficiency, turning cycle, load capacity etc.) was not sufficient for successfully competing in the respective market. Thus, following the framing of DigiCar, i.e. developing electric, shared, connected and autonomous mobility solutions, the division's management tasked the CVDU to extend its physical product portfolio through digital solutions. The underlying goal was to move from selling vans to offering digital solutions which would position AutoCo's vans at the centre of supply chain networks and enable mobility services for personal transport.

The CVDU comprised several locations. Its core team was placed near AutoCo's headquarters. However, for proximity to start-ups and tech companies, it had subsidiaries in Berlin and Silicon Valley. In these locations, the CVDU concentrated on three aspects: connecting the physical van with supply and transport systems, integrating digital solutions into the van itself (e.g. smart loading systems) and developing innovative mobility solutions with external partners (e.g. public transport companies). Regardless of its physical proximity to AutoCo's headquarters, the CVDU had little formal connection to the product development or production units. Indeed, the head of the CVDU reported directly to the commercial vehicles division's executive manager. Thus, it operated in a loosely coupled structure.

At the start, the CVDU consisted of only a handful of employees. Yet, over a time frame of three years, it grew into a unit of more than 90 employees working in two types of teams. These teams either acted as competence centres or as dedicated project teams. The first were software developers, graphic or user experience designers. The latter were responsible for the development and implementation of a particular idea or business solution. Idea development usually kicked-off with two people who proposed first drafts, solutions, and verified the idea in quick iterations. If the CVDU considered an idea to possess business potential, it staffed more employees to the respective project to realise its implementation. Depending on an idea's status and the implementation team's need for certain skills, employees from the competence centres started assisting them. This setup of competence centres and implementation teams allowed for flexible staffing in dependence on the CVDU's ideas.

The CVDU utilised multiple sources for proposing digital solutions. Concentrating on customer centricity, it first analysed AutoCo's van markets. That is, to recognise relevant branches, industries, and customers, it studied the different markets in which AutoCo sold its vans, and their growth figures. This market analysis resulted in potential industries (e.g. eCommerce, parcel delivery, craftsmen business) for digitally infused vans. Therefore, it afterwards started customer observations in these industries. In these observations, the CVDU studied how customers use their vans

and which pain points they experience. For observed pain points, the unit started developing ideas and, subsequently, possible solutions. In addition to on-site observations, the CVDU organised hackathons, visited fairs and screened technology newsletters. Deciding which ideas to develop first, the CVDU's management considered the relevance and added value to AutoCo's vans' value proposition. Then, after selecting an idea, it started its realisation.

In the realisation process of digital solutions, the CVDU also collaborated with the commercial vehicle division's product development and production unit. In fact, in terms of hiring, the CVDU ensured that it employed almost an equal share of internal and external staff. This meant that it hired both employees who already worked for AutoCo and knew its culture, structure and products well, and recent graduates as well as applicants with start-up or technology experience beneficial in introducing new ideas into AutoCo. The CVDU's management sought in this composition of staff a well-balanced mix between knowledge of AutoCo's traditional business and fresh ideas. In addition, the CVDU cooperated with start-ups. This involved investing into start-ups but also establishing joint ventures. These start-ups developed solutions which fit with one of the three aspects the CVDU focused on. For example, robots or drones for last-mile delivery, i.e. to distribute parcels from a van's load compartment to a customers' doorstep (e.g. as a digital solution integrated into AutoCo's vans). In a joint venture with one start-up, the CVDU offered a ride-sharing platform. Thus, the CVDU hired its own staff and collaborated with internal partners and start-ups to realise ideas for digital solutions.

Compared with the digital strategy unit and the HR function's digital units, the CVDU features two key differences. First, while the digital strategy unit and the HR functions' digital units focused mostly on internal processes or ways of organising, the CVDU concentrated on AutoCo's value offering. Second, the commercial vehicle's function spaced the CVDU to possess the resources to solely focus on proposing and realising ideas for digital solutions. Consequently, the CVDU could exclusively focus on DT activities. The HR function's digital units and employees, however, had to observe DT activities in addition to their HR activities. Yet, the CVDU shared the same macro-level context. That is, its micro-level activities drew on the same framing of AutoCo's DT in DigiCar and Auto2020.

5 Findings by Area of Concern

In this chapter, I summarise the underlying five articles' findings. While each article offers its own contribution, this chapter highlights the findings which form the empirical grounds for this treatise's contribution. The next sections therefore present my findings not per article, but by this treatise's three areas of concern. I will first summarise the findings within the area of concern of DT strategy. For this, I mainly draw on article I but also highlight intersecting findings from articles II and III. Subsequently, I will outline the findings on organisational change which was the main focus in articles II and III. Lastly, I outline my findings addressing the area of digital technology from articles IV and V.

5.1 Digital Transformation Strategy (Articles I, II & III)

In this area of concern, I sought to study and understand the organisational activities that enact DT strategy. In total, three of the underlying articles – I, II and III – provide findings within this area of concern. However, only article I exclusively focuses on DT strategy. Articles II and III emphasise organisational change (i.e. this dissertation's second area of concern) but their findings intersect with the area of DT strategy.

Minimal Structuring of Ideation Activities

Article I describes AutoCo's digital strategy unit. It builds on participant observations (which I conducted also at ideation events), informal interviews, archival records and digital data to investigate how the digital strategy unit relates these ideation events to AutoCo's DT strategy. Employing organisational improvisation as a theoretical framing, article I conceptualises these ideation events as "acts of organisational improvisation." With these events, the digital strategy unit creates space for AutoCo's employees to propose ideas for digital solutions. Since the digital strategy unit organises multiple events, I found that AutoCo's DT strategy unfold and manifest in a sequence of improvisational acts: unfold, as, at these events, employees propose new business ideas or internal process transformations and manifest, as

AutoCo subsequently realises selected ideas and by this, and then translates its DT strategy into concrete changes to internal processes, value creation or offerings. Yet, AutoCo's employees ideate not without structure. Indeed, the digital strategy unit projects these events unto AutoCo's DT strategy by setting a challenge. This challenge prompts employees to propose ideas fitting this challenge. The ideation events' challenges thus serve as a minimal structure. Stemming from improvisation theory, the concept of a minimal structure frames improvisational acts, i.e. it facilitates deliberate organisational improvisation by offering guidance while allowing for flexibility (da Cunha et al. 2003; Hadida et al. 2015). The ideation events' challenges thus link the employees proposing and subsequent realising of ideas to AutoCo's DT strategy. Article I's findings thus illustrate how the digital strategy unit, through minimal structuring, frames employees' ideation activities to fit AutoCo's DT strategy and how these ideation activities concretise this DT strategy.

Digital Transformation Strategy Framing Micro-level Activities

Articles II and III convey similar findings. Article II explains how AutoCo's Auto2020 strategy frames a digital workplace transformation. It outlines rationale and vision for transforming AutoCo into a digital workplace. In archival records, AutoCo reports changes to specific business processes (e.g. approval of business travel) which project previous instantiations of these processes as delegitimate. Moreover, the strategy sets eight leadership principles that envision a future leadership style for AutoCo. In this regard, I observed that managers and employees negotiate how they will handle future instances of these processes. They, e.g. discussed how to introduce workarounds to retain formal approval of business travel. Thus, while Auto2020 framed AutoCo's digital workplace transformation, it manifested in organisational members micro-level activities realising projected changes. Article III examines the digital units' coordination of DT initiatives. It traces the institutional logic underlying the digital units' coordination to AutoCo's macro-level strategy activities. That is, when, at the macro level, AutoCo's Auto2020 and DigiCar strategy emphasised the company's DT, the digital units mimicked organisational activities of tech companies (e.g. Google, Apple or Amazon) and start-ups (e.g. Uber). In other words, they combined elements of institutional logics traceable to the organisational fields of car manufacturers, tech companies and start-ups. Yet, when AutoCo's executive board shifted the company's strategic focus back to its traditional business, the digital units received pressure as their coordination activities conflicted with the traditional business' institutional logic. Thence, both article II and III's findings intersect with the area of DT strategy as they illustrate the relationship between activities framing DT strategy at the macro level and activities concretising DT strategy at the micro level. As shown in article II, we can understand the leadership principles

of Auto2020 as a minimal structure framing managers and employees' negotiations. The principles project visions for future interaction between managers and employees and thus frame negotiations on such interactions. As described in article III, the DigiCar strategy and AutoCo's vision of becoming a mobility service provider competing with tech companies frames the digital units' micro-level activities. The DigiCar strategy projects direction for the digital units' actions which, firstly, sets the focus on specific technological topics (e.g. connected and autonomous vehicles) and, secondly, bridges the organisational field of car manufacturers, tech companies and start-ups, thus extending the repertoire of legitimate micro-level activities.

Summary of the Findings on Digital Transformation Strategy

In sum, articles I, II and III contribute findings on organisational activities enactment of DT strategy. They illustrate the interplay of strategy activities at the macro- and micro-level framing and concretising of AutoCo's DT strategy through the concept of minimal structure. Article I suggests that micro-level activities relate to macro-level activities via a minimal structure. That is, the digital strategy unit organises ideation events to create space for employees to propose ideas for implementing AutoCo's DT strategy. Projecting a direction for employees' ideation activities, they provide a challenge (or theme) for each ideation event. This challenge creates a link between the micro-level activities' concretising and AutoCo's DT strategy. Intersecting with this area of concern, the findings of articles II and III illustrate that strategic initiatives, as activities at the macro level, frame micro-level activities. The first project visions and principles that serve as minimal structures for micro-level activities concretising these macro-level initiatives. Table 11 positions these three within the area of concern of DT strategy. It summarises each article, providing details about their theoretical framing and the research purpose, question and approach. In addition, it highlights the articles' key findings in relation to this dissertation's research questions.

Table 11. Summary of the underlying articles I, II and III contributing to the area of digital transformation strategy

	I. Improvising Digital Transformation Strategy	II. Deinstitutionalising the Taken for Granted	III. Traditional Trumps Digital? Competing Logics
Primary Area of Concern	<i>DT strategy:</i> Linking DT strategy and micro-level activities	<i>DT strategy:</i> Macro-level strategy narratives and their micro-level actions	<i>DT strategy:</i> Shifting macro-level strategy and its reflection at the micro level
Theoretical Core Concept	Minimal structure (improvisation theory)	Deinstitutionalisation (institutional theory)	Institutional logics (institutional theory)
Research Purpose	Understand the link between AutoCo's DT strategy and its numerous ideation events	Investigate relation between AutoCo's Auto2020 strategy and actual workplace changes	Uncover the interplay of macro-level activities and digital units' coordination of DT initiatives representing micro-level activities
Research Question	How does an organisation's DT strategy unfold in acts of organisational improvisation?	(1) What rationale does an organisation construct for its digital workplace transformation? (2) How does an organisation trigger deinstitutionalisation of established workplace practices?	How do competing institutional logics interplay in non-IT sub-communities' coordination of DT initiatives?
Research Approach	Participant observations, informal interviews, archival records and digital data	Participant observations, informal interviews, archival records and digital data	Formal interviews, participant observations, archival records and digital data
Key Findings for this Treatise	Minimal structuring of ideation events, spaces and projects provide direction for employees to propose and realise ideas which fit AutoCo's DT strategy.	Stories of Auto2020 changing internal processes frame micro-level activities which concretise these changes.	Shifts in macro-level activities of DT strategy are reflected in micro-level activities that concretise AutoCo's DT strategy.

5.2 Organisational Changes (Articles II & III)

DT is a phenomenon of IS and organisational change. Articles II and III focus on the macro- and micro-level activities that enact organisational changes in the context of AutoCo's DT. In both articles, I obtain an institutional perspective on organisational change. While article II employs the concept of deinstitutionalisation, article III draws on institutional logics. This section summarises articles II and III's findings.

Deinstitutionalisation of Existing Workplace Practices

Article II deals with the car manufacturer's strategic change programme Auto2020. To analyse Auto2020 and related activities for organisational change at the macro and micro levels, the article builds on archival records (e.g. internal and external news, and management speeches describing the strategy to AutoCo's employees), participant observations, informal interviews and digital data. Its analysis comprises two parts: first, a document analysis of the archival records on Auto2020 and second, analysis of changes noted in the remaining material. Combining these two analytical steps through the lens of deinstitutionalisation, the article describes how Auto2020 has framed erosion of established workplace practices. The concept of deinstitutionalisation is founded on the notion of change, i.e. if institutionalised practices were to infinitely stay institutionalised, they would never change. It thus captures the flipside of institutionalisation: the process by which institutionalised practices erode and dissolve (Greenwood and Hinings 1996; Oliver 1992).

Since Auto2020 is an organisation-wide change programme, AutoCo has compiled and disseminated a vast number of archival records describing the programme. These archival records project the inscribed strategic vision, the rationale underlying the strategic change programme, and – as time passes – updates on implemented changes. Providing rationale, the archival records link Auto2020 to institutional factors at the field level (e.g. new market entrants, changing concept of mobility, changing values of employees etc.). The projected vision draws an image of AutoCo adopting a “start-up spirit” to bolster its innovativeness. To edge toward this start-up spirit, the eight squads of Auto2020 proposed and realised changes to centrally defined internal processes. Article II reports two such changes, namely, removal of managerial approval requirements in AutoCo's IS for business travel and a hierarchy independent device strategy for IT equipment. It is noteworthy that the archival records on Auto2020 frame these changes as juxtapositions of the former (established) and the new workplace practices (“start-up spirit”). That is, they demarcate past practice from future practice, thus highlighting past workplace practices as “outdated” or not within the “tide of the time” and new workplace practices as “the new way of working.” The archival records therefore provide the rationale for Auto2020 but also

delegitimise part of AutoCo's established workplace practices framing the company's digital workplace transformation.

Investigating the organisational micro level, article II connects these demarcations of past and future workplace practices with empirical material from participant observations, informal interviews and digital data. In this second analytical step, I found that Auto2020 triggered negotiations between managers and employees on how they deal with the centrally implemented changes. For example, I observed conversations on whether a manager still wished to approve of an employee's business travel outside the respective IS (e.g. via email). In this example, the manager aligned with Auto2020's projected leadership principles and allowed the employee leeway in arranging business travels. Hence, the article provides two key findings. First, AutoCo's rationale for its digital workplace transformation is grounded on institutional factors. Second, it illustrates how archival records on Auto2020 frame negotiations and subsequent erosion of established workplace practices at the micro level.

Strategic Shifts Reflect in the Institutional Logics of Micro-level Activities

Article III sought to understand the significance of macro-level strategy activities for the institutional logics underlying micro-level DT activities. Thus, like article II, it takes an organisational institutionalism perspective but employs the concept of institutional logics. Institutional logics capture organisations' belief system and can be traced to their field level. They define the material practices and symbolic constructions which an institution considers legitimate. Since organisations are institutionally pluralistic, their members draw on multiple – often conflicting – institutional logics (Friedland and Alford 1991; Thornton and Ocasio 2008). At its core, article III concentrates on three sites: (1) AutoCo's organisational strategy – macro-level activity, (2) the CVDU – micro-level activities and (3) two digital units in AutoCo's HR function (i.e. the DTO HR, and a divisional HR digital unit) – micro-level activities. The study of the first site revealed two strategic foci. Engaging in its DT, AutoCo's management framed DT at the core of its strategy launching the strategy programmes DigiCar and Auto2020. While the first set the direction for AutoCo's product development, the second envisioned a new organisational culture. Jointly, however, both programmes projected the car manufacturer's mission to become a “mobility service provider” which could compete with tech companies and start-ups (e.g. Google or Uber) and with new market entrants (e.g. Tesla). Thus, they affiliated AutoCo with the organisational fields of tech companies and start-ups. Yet, in 2019, AutoCo re-framed its strategy to focus on its traditional business. This reframing involved AutoCo's executive management abandoning its projection of becoming a mobility service provider. Thus, for the first site, article III determined two framing activities: (1) becoming a mobility service provider and (2) remaining a car manufacturer.

Within the first framing – becoming a mobility service provider – AutoCo’s commercial vehicles and HR function established digital units. Thus, they spaced for DT micro-level activities. The first established the CVDU, and the second launched its DTO HR as well as digital units within the different HR divisions. Since AutoCo’s first framing affiliates the car manufacturer with the organisational field of tech companies and start-ups, these digital units adapt elements of the respective fields’ institutional logics. Coordinating DT initiatives for organisational changes in the two functions, the digital units adapt elements of the institutional logics found in start-ups or tech companies. For example, the CVDU observed customers using AutoCo’s products or organised ideation events to propose ideas for digital solutions. When implementing these ideas, it observed a “fail fast and often” mentality starting with a team of two (inspired by Amazon’s two pizza teams) and gradually – as the idea grew into a potential business – extended this team. Similarly, the HR function’s digital units organised ideation events and established an incubator for HR employees to retreat and realise their ideas for transforming AutoCo’s HR processes. Thus, as AutoCo’s framing to become a mobility service provider affiliated the company with the likes of Google, Apple and Uber, the digital units drew on these companies’ institutional logic to propose and realise organisational changes in AutoCo’s value creation, product portfolio and internal processes. The shift to the second framing activity – remaining a car manufacturer – emphasises this role of macro-level activities framing digital units’ micro-level activities.

When AutoCo reframed to remain a car manufacturer, the digital units faced pressure from the traditional business (e.g. production or product development units). The latter demanded the digital units to showcase the value of their DT activities using methods applicable within the traditional business logic and not within the tech companies or start-ups’ logic. Consequently, the digital units struggled to illustrate their digital solutions’ business cases to senior and executive managers within AutoCo’s traditional business, thus entailing budget cuts. This forced them to revert their micro-level activities to follow the reframing. This meant that the digital units paused or terminated proposing new or realising existing and ongoing digital solutions. Thus, article III’s findings highlight the importance of macro-level activities’ framing for the legitimacy of the institutional logic underlying the micro-level activities that concretise (propose and realise) organisational changes to value creation, product portfolio in detail and internal processes.

Summary of the Findings on Organisational Changes

The findings in articles II and III offer insights into how AutoCo’s DT activities at the macro and micro levels jointly enact organisational change. Article II reports that AutoCo – on a macro level – disseminated archival records framing pat workplace

practices as delegitimate. This delegitimation triggered negotiations on how to realise intended changes at the micro level. Moreover, it found that AutoCo grounds its rationale for its digital workplace transformation on institutional factors at the field level. Similarly, article III also foregrounds the matter of legitimacy. Its findings illustrate that AutoCo's macro-level activities frame which micro-level activities are legitimate ones to propose and realise organisational changes. Table 12 outlines the two articles' key findings within the area of DT and organisational change.

Table 12. Summary of the underlying articles II and III contributing to the area of digital transformation and organisational change

	II. Deinstitutionalising the Taken for Granted	III. Traditional Trumps Digital? Competing Logics
Primary Area of Concern	<i>DT and organisational change:</i> Institutional factors and rationale for transforming workplace practices	<i>DT and organisational change:</i> Adaptation of institutional logics for transforming value creation
Theoretical Core Concept	Deinstitutionalisation (institutional theory)	Institutional logics (institutional theory)
Research Purpose	Identify triggers for eroding workplace practices in the context of AutoCo's digital workplace transformation	Uncover the interplay of macro-level strategy and the institutional logics underlying digital units' coordination of DT initiatives
Research Question	(1) What rationale does an organisation construct for its digital workplace transformation? (2) How does an organisation trigger deinstitutionalisation of established workplace practices?	How do competing institutional logics interplay in non-IT sub-communities' coordination of DT initiatives?
Research Approach	Participant observations, informal interviews, archival records and digital data	Formal interviews, participant observations, archival records and digital data
Key Findings for this Treatise	Macro-level activities for AutoCo's digital workplace transformation construct institutional factors as the rationale for its centrally implemented changes to certain workplace practices. Documents reporting on these changes frame established practices and delegitimate and project principles for future workplace practices. This framing triggers negotiations between managers and employees in which they realise erosion of established workplace practices at the micro level.	AutoCo's macro-level activities provide two different strategic framings. The first (projecting DT) provides legitimacy for digital units to adapt elements of the institutional logic of startups, tech companies, and new competitors for their micro-level activities of proposing and realising organisational changes. The second (projecting AutoCo's traditional business) pressures digital units to pause and terminate their DT activities.

5.3 Digital Technology (Articles IV & V)

Digital technologies take a pivotal role in DT. In this area of concern, I thus studied AutoCo's organisational activities enacting digital technologies. Since DT involves multiple digital technologies (Vial 2019), I have obtained a digital infrastructure perspective. Digital infrastructures comprise several digital technologies forming a shared and heterogenous IS. As digital infrastructures' installed base evolves (i.e. the existing digital technologies forming the digital infrastructure), it gradually extends into a more complex form (Henfridsson and Bygstad 2013; Tilson et al. 2010). Articles IV and V delve into the activities that enacted AutoCo's digital infrastructure cultivation. In Auto2020, AutoCo framed internal collaboration through digital technologies as a means of improving its innovativeness in value creation and offering. Based on this projection, it started cultivating its digital infrastructure for collaboration. Yet, at some point, AutoCo's employees approached the digital strategy unit asking for assistance to find and access digital technologies. They experienced the company's digital infrastructure for collaboration as a "digital jungle." Investigating the digital jungle, article IV concentrates on the digital strategy units' activities to facilitate employees in navigating the digital jungle, while article V focuses on the digital jungle's cultivation.

Navigating a Digital Infrastructure that Became a Digital Jungle

Article IV examines two aspects of AutoCo's digital infrastructure cultivation. First, it delves into the company's cultivation of its digital infrastructure for collaboration as part of its Auto2020 strategy. Second, it investigates the recognition of the digital infrastructure having become a digital jungle and the digital strategy units' approach to assist employees in navigating this jungle. The archival records on Auto2020 noted that digital technology can improve internal collaboration and, as a result, AutoCo's innovativeness. For this reason, the digital technology squad cultivated the company's digital infrastructure for collaboration. Since the squad shared this goal (improving collaboration through digital technologies) with AutoCo's digital strategy unit, the two jointly extended the car manufacturer's installed base. For example, in 2017, they proposed and realised three digital technologies: a new enterprise social media, an instant messaging platform and a collaboration platform for teams. Similarly, Auto2020's framing of digital collaboration has steered employees' attention toward AutoCo's growing digital infrastructure. Indeed, the archival records on Auto2020 outlined the importance of employee empowerment in the selection of digital technologies. Accordingly, employees should be empowered to independently select and access the digital technologies they require for their work. Yet, AutoCo's employees struggled to identify the right collaboration tools and, thus, approached the digital strategy unit's collaborate team referring to the digital

infrastructure as a digital jungle. Responding to their struggle, the digital strategy unit compiled a “digital collaboration tools compass” on AutoCo’s enterprise social media. Article IV describes this compass as a symbolic representation of AutoCo’s digital infrastructure for collaboration. The compass categorises the digital technologies constituting the digital infrastructure by use cases. By doing this, it facilitates employees in identifying digital technologies which offer action potentials for their desired use case. The article thus provides three observations. Firstly, it conceptualises the digital jungle as an infrastructure thicket impeding its use. Secondly, it thickly describes the macro-level activities framing cultivation of a digital infrastructure for collaboration crucial for the AutoCo’s DT as well as micro-level activities concretising this framing (e.g. realising a new enterprise social media platform). Lastly, it outlines the digital strategy unit’s tools compass which facilitates employees in navigating AutoCo’s digital jungle.

Evolution Dynamics Cultivating the Digital Jungle

Article V extends article IV, not in delving into the digital strategy unit’s articulation of AutoCo’s digital jungle but in uncovering the evolution dynamics that engendered its cultivation. Article IV focuses on AutoCo’s macro-level activities as well as the digital technology squad’s and the digital strategy unit’s micro-level activities cultivating the digital infrastructure top-down. Extending this focus to employees’ micro-level activities, article V describes how employees have drawn on Auto2020’s framing of employee empowerment and digital collaboration as being crucial for DT. Within this framing, employees engaged in activities cultivating the company’s digital infrastructure bottom-up. For example, in the search for an interactive slide show tool, employees proposed and used a respective cloud service despite its use breaching AutoCo’s IT policies. Becoming aware of the cloud service’s widespread use amongst employees, the digital strategy unit listed it in its compass as prohibited. Yet, as employees kept using the cloud service, the digital strategy unit triggered its approval process to officially add it to AutoCo’s digital infrastructure. Thus, while the digital technology squad (Auto2020) and the digital strategy unit’s micro-level activities cultivated AutoCo’s digital infrastructure for collaboration top-down, AutoCo’s employees also cultivated it bottom-up. Article V delves into these two trajectories of micro-level activities to understand AutoCo’s cultivation of a digital jungle.

The terms *cultivation* and *jungle* constitute an oxymoron. While cultivation implies purposeful action, a jungle, although beautiful in its own way, denotes wilderness. Why would a company cultivate a jungle and not a garden? Digging into this oxymoron, article V shows that the actors cultivated AutoCo’s digital infrastructure for collaboration purposefully within both trajectories: (1) the top-down trajectory

inscribed in Auto2020 and (2) the bottom-up trajectory emerging from employees' cultivation activities. Article V's findings thus suggest that the two trajectories jointly explain the cultivation of AutoCo's digital jungle. They stress that, on neither level, the actors intended a digital jungle but meant to purposefully cultivate the company's installed base. Yet, since both trajectories targeted the same installed base, they resulted in it evolving into a digital jungle.

Summary of the Findings on Digital Technology

Both articles address this dissertation's third area of concern, taking a digital infrastructure perspective. Specifically, they document the organisational activities that cultivate AutoCo's digital infrastructure into a digital jungle. Article IV thickly describes macro-level activities framing AutoCo's digital infrastructure cultivation. They create space for respective micro-level activities (e.g. employee empowerment) and project direction (e.g. digital technology improves internal collaboration). Further, it outlines the digital strategy unit's response to the digital jungle, i.e. a symbolic representation of AutoCo's digital infrastructure for collaboration. Article V extends article IV by focusing on the micro-level activities that cultivate AutoCo's digital infrastructure. Combining the micro-level activities of the digital technology squad and the digital strategy unit as well as employees in one framework of evolution dynamics, it conceptualises two cultivation trajectories for the company's digital jungle emergence. Jointly, the articles illustrate how an interplay of macro- and micro-level activities frame and concretise digital infrastructure evolution resulting in a digital jungle. Moreover, the digital jungle challenges the concept of infrastructure drift. It stresses that digital infrastructures cannot only drift from management control but also from users' grasp and thus, use. Table 13 outlines the two articles' research purpose, question, and approach as well as their key findings for this dissertation within the area of concern of digital technology.

Table 13. Summary of the underlying articles IV and V contributing to the area of digital technology

	IV. Navigating in the Digital Jungle: Articulating Combinatory Affordances of Digital Infrastructures for Collaboration	V. Cultivating a Digital Jungle: Toward a Hybrid Governance Perspective on Digital Infrastructures
Primary Area of Concern	<i>Digital technology:</i> Effective use of growing a digital infrastructure for collaboration	<i>Digital technology:</i> Evolution dynamics underlying cultivation of a digital jungle
Theoretical Core Concept	Infrastructure evolution (digital infrastructures)	Infrastructure evolution (digital infrastructures)
Research Purpose	Investigate AutoCo's digital infrastructure for collaboration to understand (1) the first order concept of digital jungle and (2) AutoCo's activities to assist its employees in effectively using the organisational digital infrastructure	Identify, understand and explain the infrastructure evolution dynamics that underly AutoCo's cultivation of its digital infrastructure for collaboration into a digital jungle
Research Question	How can an organisation facilitate effective use of its digital infrastructure?	What happens when an organisation engaging in its DT decides to expand its digital infrastructure for collaboration through its existing top-down governance while simultaneously introducing elements of bottom-up governance?
Research Approach	Participant observations, informal interviews, archival records and digital data	Participant observations, informal interviews, archival records and digital data
Key Findings for this Treatise	The macro-level narrative frames cultivation of AutoCo's installed base to improve cross-functional collaboration and internal innovation. Cultivation entails employees referring to the digital infrastructure as a digital jungle. The digital strategy unit articulates AutoCo's digital infrastructure to facilitate employees in its effective use.	The macro-level framing entailed micro-level activities enacting two trajectories – top-down and bottom-up – which concretise AutoCo's digital infrastructure evolution. While the digital technology squad and digital strategy unit cultivate the digital infrastructure top-down, employees cultivate it bottom-up. Thus, an interplay of evolution dynamics at the macro and micro levels engenders cultivation of a digital jungle.

6 Discussion and Implications

Seeking to improve our understanding of incumbent company's organisational DT, this dissertation has posed the research question of *how incumbent organisations' macro- and micro-level activities enact DT*. To answer this question, I have formulated three research sub-questions. Each of these sub-questions focuses on a specific area of concern within DT research: DT strategy, organisational changes and digital technology. Moreover, each of these sub-questions draws on a respective theoretical framing: organisational improvisation, institutional theory and digital infrastructures. In this chapter, I first discuss this dissertation's findings on the backdrop of the underlying research questions. Drawing on this discussion, I outline implications for DT research, the selected theoretical angles and practice, and I conclude by evaluating this research against criteria for high-quality ethnographies.

6.1 Macro- and Micro-level Activities Enacting Digital Transformation

At the outset of this dissertation, I outlined three observations which underlie this enquiry. First, existing IS literature on DT has emphasised either macro- (e.g. Karimi and Walter 2015; Svahn et al. 2017) or micro-level activities (e.g. Chantias et al. 2019). Scholars concerned with the organisational macro level have focused, e.g. on organisational strategy (e.g. Matt et al. 2015; Sebastian et al. 2017) and implementation of changes at an organisational level (e.g. Fuchs and Hess 2018; Svahn et al. 2017; Tumbas et al. 2018) to study and reveal the organising principles underlying DT. These studies foregrounded DT activities that span across entire organisations (or at least greater parts of an organisation) to understand DT at an abstract level of organising. However, studies at the organisational micro level have emphasised the emergent nature of DT (e.g. Berghaus and Back 2017; Chantias et al. 2019; Utesheva et al. 2016). They studied a particular unit or actor and their concrete practices of organising for DT generating insights into what organisations actually do when they embark on their DT. Secondly, scholars studying organisational transformation have argued that respective transformations constitute mixed-level phenomena (Markus and Robey 1988). Thus, studying phenomena of organisational transformation, we should consider both the organisational macro and micro levels (Leonardi and Barley

2010). Thirdly, van de Ven and Poole (2005) put forth that organisational phenomena are not fixed entities or events but exist through a continuous process of becoming. This perspective of becoming emphasises that actors' actions and activities enact organisational phenomena. Fusing these observations with prior literature, I sought to explore *how incumbent organisations' macro- and micro-level activities enact DT*. To guide my enquiry into this overarching research question, I generated three research sub-questions:

1. *How do an incumbent organisation's activities enact DT strategy through the lens of improvisation theory?*
2. *How do an incumbent organisation's activities enact organisational changes through the lens of institutional theory?*
3. *How do an incumbent organisation's activities enact digital technologies through the lens of digital infrastructure evolution?*

The three research sub-questions carve out three areas of concern: (1) DT strategy, (2) organisational changes (comprising changes to both organisational structures and value creation) and (3) digital technology. I inferred these areas of concern from Vial's (2019) DT framework and, thus, aligned my own research with the foci of existing IS research on DT. Given my perspective of organisational becoming, each sub-question proposes to investigate the enactment of DT within its area of concern. Further, they also conceptually frame the study of each area of concern. That is, they require examining the enactment of DT through three different conceptual lenses, namely, organisational improvisation, institutional theory and digital infrastructures. In my endeavour to answer these research questions, I have compiled and published five articles which individually address one of the sub-questions but jointly outline this dissertation's findings. These five articles stem from my ethnographic enquiry of an incumbent car manufacturer's (AutoCo) DT activities. I chose to study an incumbent organisation for the relevance and importance of its DT for both its own business success and economic importance to larger regions and society. Before answering the main research questions, I next draw on the underlying five article's findings to first address each sub-question.

6.1.1 Enacting Digital Transformation Strategy

The first sub-question guided the enquiry into *organisational activities' enacting DT strategy through the lens of improvisation theory*. Prior literature on DT strategy either studies strategy as an object or a practice. The first focuses on macro-level aspects, the abstract organising principles inscribed in DT strategies, to reveal templates for what makes a "good" DT strategy (e.g. Matt et al. 2015; Ross et al. 2016). The second stresses the operational level of DT strategy making, i.e. it focuses on

concrete practices from which DT strategy emerges (e.g. Berghaus and Back 2017; Chanias et al. 2019; Henfridsson and Lind 2014). This second body of research also emphasises the informal nature of DT strategy making and links this informality to the dynamic and volatile conditions which DT strategies address (Berghaus and Back 2017). Theory-wise, DT strategy scholars have employed resource-based and activity-based views (e.g. Berghaus and Back 2017; Pavlou and el Sawy 2010; Yeow et al. 2018) or strategy-as-practice (e.g. Arvidsson and Holmström 2017; Chanias et al. 2019). Yet, studies have also drawn on improvisation theory. For example, Pavlou et al. (2010) introduced the notion of improvisational capabilities as a third type of IT capability for organisations to handle unanticipated changes in digitalisation. In this vein, Levallet and Chan (2018) have studied how IS can facilitate organisational improvisation and, in particular, the practice of strategic improvisation.

Against the existing DT strategy research, the findings concerning the first sub-question make two contributions: (1) they suggest a third perspective on DT strategy, and (2) they introduce the concept of minimal structure to DT strategy research and, more generally, to IS strategy studies.

Mixed-level Perspective on Digital Transformation Strategy Making

The findings suggest a third perspective which fuses the macro-level view with abstract organising principles (Matt et al. 2015; Ross et al. 2016; Sebastian et al. 2017) and the micro-level view of emergent DT strategy (Berghaus and Back 2017; Chanias et al. 2019). The findings illustrate that organising principles and concrete practices interplay in DT strategy making (cf. Henfridsson and Lind 2014). While organisational actors' activities at the macro level provide organising principles, which frame organisations' DT, activities at the micro level draw on these principles to concretise both these principles and the framed plans. An either/or focus on macro- or micro-level activities tends to miss this interplay explaining merely either abstract principles or concrete practices at the respective organisational level. The dissertation's findings suggest, however, that DT strategy neither merely emerges bottom-up through concrete practices nor is it only set top-down through organisation wide strategy programmes. It becomes enacted through an interplay of the principles inscribed in these strategy programmes and the concrete strategy practices which draw and manifest these principles. This suggests a third perspective, proposing to explicitly study this interplay rather than strategy activities at either of the two organisational levels separately.

Minimal Structure Linking Mixed-level Digital Transformation Strategy Making

This dissertation introduces the concept of minimal structure from organisational improvisation to DT strategy research. Scholars have drawn on organisational improvisation to argue for the need of a third capability or to study how IS facilitates improvisation (Levallet and Chan 2018; Pavlou and el Sawy 2010). However, this dissertation introduces the concept of minimal structure into research on DT strategy. It offers a conceptual lens for explaining the interplay between macro- and micro-level activities enacting DT strategy. Namely, it can explain how organisational actors draw on the organising principles provided in macro-level activities to frame actors' concrete practices (i.e. micro-level activities) through minimal structuring. This minimal structure then guides micro-level activities but also grants flexibility in concretising intended strategy to become realised strategy (Chanias and Hess 2016; Henfridsson and Lind 2014). In regard to its first area of concern, this dissertation thus illustrates how AutoCo structured its DT strategy activities minimally to offer employees both flexibility and guidance in developing ideas to manifest its DT strategy.

6.1.2 Enacting Organisational Changes

The second sub-question proposed to study *organisational activities which enact organisational changes through an institutional lens*. Scholars investigating organisational changes in DT have reported changes to internal processes and to value creation and proposition (e.g. Nambisan et al. 2017; Porter and Heppelmann 2014; Svahn et al. 2017). In their investigations, they have focused on the creation of new structures (e.g. CDOs or digital units) (e.g. Fuchs et al. 2019; Haffke et al. 2016), organisations' infusion of their value proposition with digital (e.g. Lyytinen et al. 2016; Svahn et al. 2017) and changes to identity (e.g. Tripsas 2009; Utesheva et al. 2016). These studies have either investigated these changes at the organisational macro level (e.g. Karimi and Walter 2015; Tripsas 2009) or micro level (e.g. Utesheva et al. 2016). Further, they have taken a strong technology imperative. That is, existing research often assumes the rationale underlying DT in digital technology. We can infer this from statements such as digital technology "driving" or "enabling" DT (e.g. Chanias and Hess 2016; Porter and Heppelmann 2014). To study these changes, Hinings et al. (2018) suggested an institutional perspective. They foregrounded this perspective's core notion of legitimacy as soliciting interesting angles for studying organisations' DT. Existing studies employing an institutional perspective found, e.g. that institutional logics influence innovation activities (Tumbas et al. 2015); that start-ups span organisational fields, i.e. combine elements of these fields' institutional logics to gain legitimacy and challenge incumbents in these fields (Tumbas

and vom Brocke 2017); or that CDOs engage in institutional work to carve out their jurisdiction at the C-suite level (Tumbas et al. 2018).

Extending existing literature, this dissertation's findings on its second sub-question make three contributions to DT research on organisational changes: (1) organisational macro-level activities project direction and lend legitimacy for micro-level activities, (2) DT involves deinstitutionalising the old to create space for the new and (3) organisations also construct institutional factors as their rationale for DT.

Introducing New Institutional Logics to Drive Digital Transformation

AutoCo's strategic change programmes (i.e. Auto2020 and DigiCar) set the company on a path to become a mobility service provider. They affiliated the car manufacturer with the organisational fields of tech companies (e.g. Google, Apple and Microsoft) and start-ups. Thus, this dissertation's findings suggest that not only start-ups span organisational fields to challenge incumbents (Tumbas and vom Brocke 2017), but also incumbents span organisational fields to respond to digital disruption. Spanning organisational fields, AutoCo introduced new institutional logics and, thus, new organising principles projecting direction and lending legitimacy to a new set of micro-level activities driving DT. However, the findings also illustrate the fragility of such a direction and legitimacy inferred from spanning organisational fields. When AutoCo re-emphasised its affiliation with its original organisational field (i.e. automotive industry), its digital units struggled to demonstrate their activities fit with the company's shifted macro level, its organising principles of a car manufacturer. This shift indicates that organisational macro-level activities span organisational fields which introduces new institutional logics projecting direction for and legitimising micro-level activities.

New Organising Principles Involve Erosion of Existing Workplace Practices

This dissertation's findings suggest that DT requires abandoning the established. They illustrate the role of deinstitutionalisation for DT and organisational change in general. Scholars have argued that, for change to occur, institutions must erode (Greenwood and Hinings 1996; Oliver 1992). For its Auto2020 programme, the car manufacturer constructed narratives of implemented changes that delegitimised established workplace practices, thus creating space for new practices. In addition, the programme outlined leadership principles projecting the company's future organising principles. The engendered negotiations between managers and employees then concretised these organising principles in practices at the operational level of organising. Yet, these negotiations took place against the delegitimation – abandoning – of established workplace practices through altered organising principles at the macro

level. Thus, this study's findings emphasise the importance of deinstitutionalisation for DT. Against existing literature, they challenge us to not only assume DT as creating the new based on digital technologies (cf. Vial 2019) but also requiring erosion of the old. Reflected against the first sub-question, the enquiry into the second sub-question illustrates that, to create something new, the established – or old – must erode, i.e. give space. In this way, the findings illustrate deliberate triggering of such erosion through shifting organising principles and subsequent concretising in actual practices of organising.

Digital Transformation Follows an Emergent Perspective

AutoCo constructed the rationale for its digital workplace transformation based on institutional factors (Oliver 1992). The narrative analysis of AutoCo's archival records on its Auto2020 programme revealed a set of institutional factors. The company motivated these factors as its rationale for Auto2020 which encapsulated a shift in the company's abstract organising principles. Specifically, Auto2020 defined new organisational structures and leadership principles conducive to digital innovation. While existing literature has positioned digital technology as driving respective shifts, AutoCo grounded its rationale on institutional factors linked to societal (e.g. changing concept of mobility), economical (e.g. new market entrants) or organisational (e.g. new leadership styles) elements. With these factors, AutoCo constructed an organisational imperative rather than a technology imperative for Auto2020 (Markus and Robey 1988). We could refute this interpretation, arguing that we can trace the constructed institutional factors to organisational actors actualising digital technologies. Yet, this conception of the institutional factors originating from actors actualising digital technologies only stresses the importance of an emergent perspective (Markus and Robey 1988) on the organisational changes in DT. It shows that we can solely attribute DT to neither a technology nor an organisational imperative. Thus, this dissertation's findings suggest an emergent perspective toward DT.

6.1.3 Enacting Digital Technology

The third sub-question delves into *organisational activities that enact digital technologies employing a digital infrastructure perspective*. Digital technologies are central in past DT research. Compared with IT-enabled organisational transformation, DT seems to stem from multiple digital technologies rather than one large IS (e.g. ERP or CRM systems) (Vial 2019). Conceptually, existing research outlines different attributes of digital technologies that explain their impact on organisations' value creation and offering (e.g. Baskerville et al. 2020; Kallinikos et al. 2013; Yoo et al. 2010). Similarly, empirical studies have mostly focused on digital technologies' role

in the product development process, i.e. digital innovation (e.g. Lyytinen et al. 2016; Nambisan et al. 2017; Yoo et al. 2012). These studies recognised a platformisation and infrastructurisation (Bygstad and Hanseth 2018; Constantinides et al. 2018). Accordingly, organisations tend to cultivate digital infrastructures which underlie digital platforms that constitute the basis for value networks and digital ecosystems.

Digital infrastructure is an IS concept which combines social (e.g. norms, inscribed behaviour and policies) and technical (e.g. interface specifications and communication protocols) elements of ecologies of digital technologies into one IT artefact (Tilson et al. 2010). The concept stems from the IS research tradition in information infrastructures, IT infrastructures and eHighways (Edwards et al. 2009). Studying infrastructures, IS scholars have focused on their design (e.g. Hanseth and Lyytinen 2010) and evolution (e.g. Fürstenau, Baiyere, et al. 2019; Henfridsson and Bygstad 2013; Øvrelid and Bygstad 2019). Studying their evolution, Ciborra and Hanseth (2000) found that evolving infrastructures tend to drift from management control. This conception reflects the existing literature's emphasis on managerial views on digital infrastructures and their evolution.

Taking a digital infrastructure view in investigating organisational activities that enact digital technologies, this treatise's findings make three contributions: (1) they extend the digital infrastructure view in DT research to digital infrastructures for collaboration, i.e. work infrastructures; (2) they contribute evolution dynamics and the emic concept of digital jungle to digital infrastructure evolution research; and (3) they illustrate that infrastructures not only drift from management but also users.

Digital Transformation Rests on Digital Infrastructures for Collaboration

Research has conceptualised an infrastructurisation in digital technologies underlying organisations' value creation and offering (Constantinides et al. 2018). While AutoCo also utilised digital technologies to alter its value proposition (e.g. DigiCar or within the CVDU), this treatise has focused on its infrastructurisation of its digital technologies for internal collaboration. Part of Auto2020 goal was to extend the company's installed base of digital collaboration tools. It formulated two objectives: to offer AutoCo's employees digital technologies that improve their collaboration capabilities and to empower employees to choose which of these technologies they require for their work. Hence, we can conceive of this digital infrastructure as a work infrastructure (Pipek and Wulf 2009). From this, an installed base emerged which was manifested in the digital strategy unit's digital collaboration tools compass. Thus, this treatise illustrates that organisations cultivate infrastructures not only for altering their value creation (Constantinides et al. 2018; Fürstenau, Baiyere, et al. 2019) but also as work infrastructures for altering internal processes or organising *per se*. Since digital infrastructures inscribe behaviour, social norms and policies

(Hanseth and Monteiro 1997), organisations may cultivate these digital *work* infrastructures in order to cultivate new work practices or organisational culture (Hanseth and Lundberg 2001; Pipek and Wulf 2009). This prospect underpins that infrastructurisation in DT not only concerns digital infrastructures underlying value creation but also work infrastructures.

Evolution Dynamics Explaining the Emergence of the Digital Jungle

This treatise contributes a set of evolution dynamics explaining the emergence of the digital jungle. Investigating the macro- and micro-level activities enacting the digital jungle, this dissertation conceptualises a set of evolution dynamics that constitute a macro- and a micro-level cultivation trajectory (see articles IV and V). The macro-level activities formulated abstract notions for AutoCo's digital infrastructure for collaboration and cultivated an organisation-wide installed base. The micro-level activities drew on the abstract notions for the digital infrastructures' cultivation. Moreover, they concretised these notions in local (i.e. within one unit or a function) cultivations which started off as shadow or business-managed IT (Fürstenau and Rothe 2014; Haag and Eckhardt 2017; Klotz et al. 2020) but occasionally became part of the organisation-wide installed base. Conceptualising these activities, this treatise provides a framework of evolution dynamics explaining AutoCo's digital infrastructure evolution into a digital jungle (see article V). The framework illustrates that, in DT, digital infrastructures become co-enacted by managerial actions framing the notion for digital infrastructure development (e.g. projecting a direction and abstract principles on how to cultivate the digital infrastructure) and user actions concretising this framing relating it to their operational level and cultivating the infrastructure against the backdrop of their work tasks.

Digital Jungle Captures that Infrastructures Drift from Users

The literature on digital infrastructure design and evolution mainly observes a managerial view. That is, it focuses on better understanding digital infrastructures and their evolution and governance to assist managers in their coordination of these infrastructures (Ciborra and Hanseth 2000; Constantinides and Barrett 2014; Tilson et al. 2010). In this vein, the concept of infrastructure drift captures that infrastructures tend to drift from management control but address the possibility that infrastructures may also drift from users (Ciborra and Hanseth 2000). The emic concept of the digital jungle captures this possibility as it highlights that digital infrastructures cannot only drift from management control, but also from the users' grasp and, thus, use. In this way, it conceptualises a possible outcome of digital infrastructure evolution in organisations' DT. Specifically, it stresses what can occur if the interplay between

macro-level and micro-level DT activities lacks adequate guidance. Reflected against the first and second sub-questions, this contribution reveals that an interplay of macro-level and micro-level activities with little guidance can entail unexpected and undesired DT outcomes. The construct of minimal structure may thus also offer interesting perspectives on user-oriented digital infrastructure cultivation.

6.1.4 Macro- and Micro-level Activities Co-enacting Digital Transformation Through Framing and Concretising

The sub-questions formed individual enquiries into DT. Jointly, their findings answer to the dissertation's overarching research question. Across all three areas of concern, these findings portray DT as becoming enacted through an interplay of macro- and micro-level activities. This section, drawing on the perspective of organisational becoming and this dissertation's findings, conceptualises the becoming of DT as co-enactment.

The perspective of organisational becoming conceives organisational phenomena not "as entities, as accomplished events, but as enactments—unfolding processes involving actors making choices interactively, in inescapably local conditions, by drawing on broader rules and resources" (Tsoukas and Chia 2002, p. 577). Tsoukas and Chia highlighted both the macro and micro levels. They referred to the macro level as the "broader rules and resources" which actors' draw on in their activities, and to the micro level as "inescapably local conditions" of organisational actors' activities. Hence, organisational becoming outlines at least two conceptual positions for studying organisational phenomena: first, these phenomena become enacted through organisational actors' activities; second, these activities are situated in both macro- and micro-level conditions. Related to my working definition of macro- and micro-level activities, the macro-level activities enact the "broader rules and resources" as organising principles or abstract ideas for organisational structures and organising, while micro-level activities draw on these broader rules and manifest them within "inescapably local conditions." Pausing and reflecting on these conceptions, we can conclude that, if organisational phenomena at both the macro and micro levels become enacted through organisational activities, macro- and micro-level activities interplay. In this interplay, macro-level activities enact phenomena that become part of the "broader rules and resources" for micro-level activities. In turn, micro-level activities enact phenomena that become macro-level activities. That is, they propose and realise concrete actions for DT (strategy) which become blueprints, abstract notions or principles for future micro-level activities. Hence, to understand organisational phenomena's becoming, we must consider the interplay of macro- and micro-level activities (Leonardi and Barley 2010; Markus and Robey 1988).

DT is a phenomenon at the intersection of IS and organising. Taking a perspective of becoming, I have focused on DT activities at the organisational macro and micro levels but especially on their interplay. The findings related to the three sub-questions suggest that this interplay comprises macro-level activities which frame activities at the micro level, while the latter concretise the first. The first sub-question revealed that AutoCo gives employees space but also projects direction via minimal structuring of ideation events. At these events, employees propose ideas and subsequently realise selected ones. They concretise AutoCo's DT strategy. The second sub-question revealed that macro-level activities grant space through new structures (e.g. digital units) and through deinstitutionalising existing structures. AutoCo's strategic change programmes (i.e. Auto2020 and DigiCar) then project how to fill this space. They span organisational fields which introduces new institutional logics and outlines principles for future workplace practices. Against these, employees negotiate workplace practices with their management and digital units propose and realise digital solutions following elements of institutional logics other than AutoCo's. They concretise AutoCo's framing through realising its projections within their local conditions. The third sub-question illustrates that the interplay of framing and concretising can co-enact undesired DT outcomes. At AutoCo, empowering employees to freely choose their digital technologies created space for respective micro-level activities. Further, the objective of leveraging digital collaboration to boost innovation projected direction. Suggesting but also integrating digital technologies, both the digital strategy unit and employees concretised AutoCo's macro-level activities for a digital infrastructure for collaboration. Realising the projection of a digital infrastructure for collaboration, these micro-level activities concretised AutoCo's framing to become a digital jungle. The digital strategy unit responded to this outcome at the macro-level by reframing the digital infrastructure with its navigation compass. This highlights that the interplay of framing and concretising can co-enact undesired DT outcomes which entail reframing. Across all three sub-questions, we can thus find activities of framing (spacing and projecting) and concretising (proposing and realising) which form an interplay that *co-enacts* organisational DT.

In *framing*, macro-level activities define and create space *for* as well as outline projections *of* DT which define the broader rules and resources for organisational members to work them out. Through the mechanisms of spacing and projecting, they frame micro-level activities. In *spacing*, macro-level activities allocate resources (e.g. time and budget), delegitimise established workplace practices, empower employees for certain activities and create organisational structures (e.g. ideation events, digital units) for micro-level activities. In *projecting*, macro-level activities outline DT plans providing visions and direction through minimal structuring of ideation events, spanning organisational fields or cultivating a digital infrastructure for collaboration at the macro level.

In *concretising*, micro-level activities propose and realise ideas for DT. Through the mechanisms of proposing and realising, they manifest DT in observable outcomes and, by doing this, concretise organisational macro-level activities. In *proposing*, micro-level activities identify and suggest ideas for DT (e.g. ideas for digital solutions or digital technologies for collaboration) against broader rules and local conditions. In *realising*, micro-level activities implement digital solutions, integrate digital technologies or negotiate future workplace practices manifesting observable outcomes of DT.

Jointly, framing (spacing and projecting) and concretising (proposing and realising) grasp and explain the *co*-enactment of DT through an interplay of macro- and micro-level activities. While they enabled me to dissect this interplay analytically, empirically this interplay appears as inseparable. Thus, the framing of macro-level activities requires micro-level activities that it can frame, and for concretising, micro-level activities draw on macro-level activities while manifesting the macro-level for future micro-level activities. Explaining the one thus builds on the existence of the other. This implies that they exist only in relation or within their interplay. The notion of *co*-enactment thus stresses the importance of conceiving DT not as an organisational phenomenon enacted either at the macro or micro level. It emphasises that DT becomes *co*-enacted through an interplay of macro- and micro-level activities with the first framing the latter and the latter concretising the first (and vice versa). Conceiving DT as becoming *co*-enacted foregrounds this inseparable interplay rather than macro- or micro-level activities. Figure 6 illustrates how macro- and micro-level activities co-enact DT through framing (spacing and projecting) and concretising (proposing and realising) and links these concepts to the underlying articles' empirical observations.

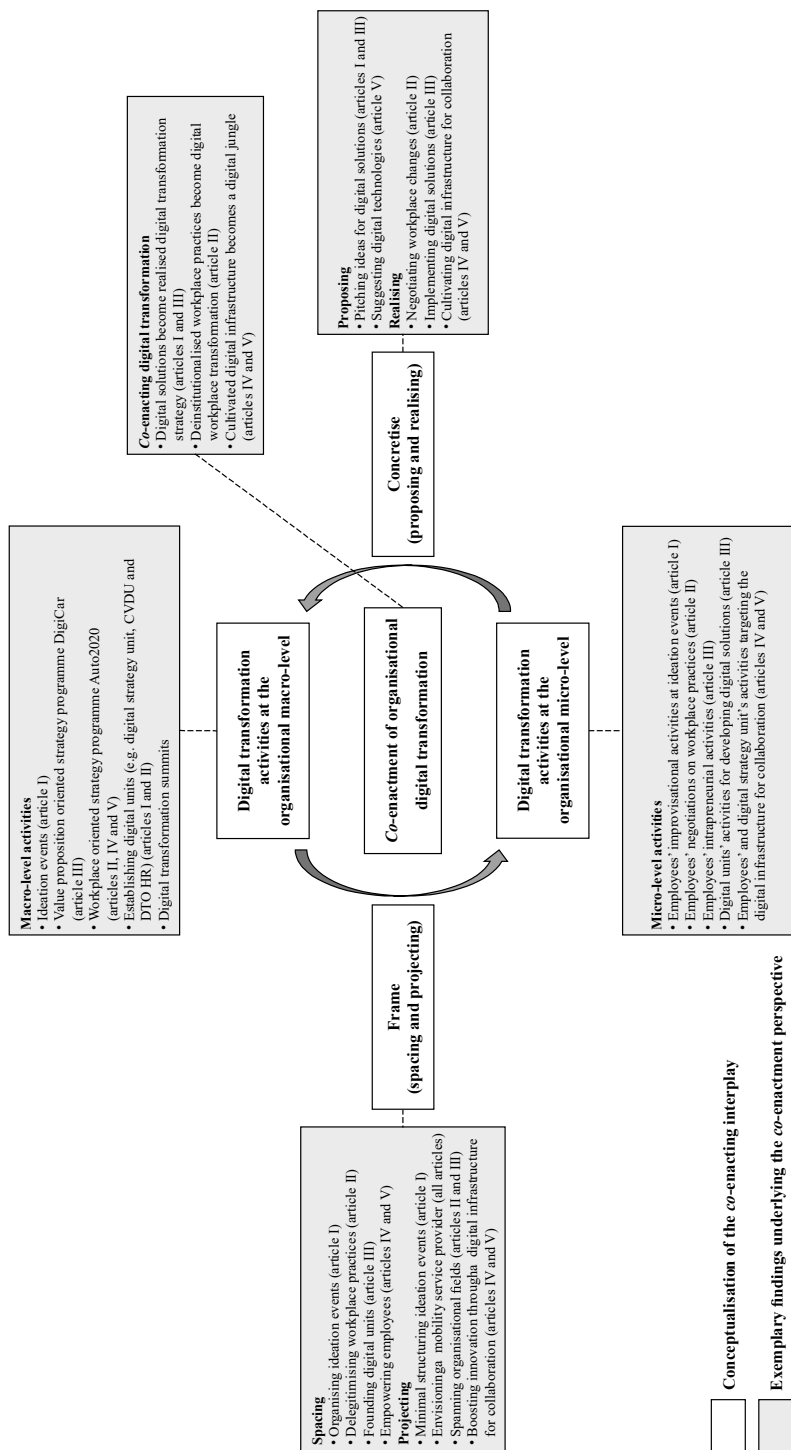


Figure 6. Conceptualising the interplay of organisational macro- and micro-level activities co-enacting digital transformation through framing and concretising

6.2 Implications for Digital Transformation Research

Central to this dissertation's enquiry were two observations. Firstly, existing DT literature has either studied organisational macro- or micro-level activities. Secondly, prior studies have focused on managerial views, i.e. scholars have drawn mostly on empirical material constructed with executive and senior managers (e.g. in interview or survey research). Thus, they have often taken a research-down perspective (Eberle and Maeder 2016). Stressing either the macro or the micro level of a phenomenon as well as residing within a managerial perspective can entail a lopsided understanding of a phenomenon (Clarke and Davison 2020; Leonardi and Barley 2010). Reflecting these observations, I took a research-up perspective and focused on the interplay between macro- and micro-level activities to contribute to DT research. In the field, I have studied the research site's DT from an employee view. Yet, I focused not on employees' day-to-day tasks and how these evolve along the organisation's DT. Rather, I wove a network across different focal sites within the research site and their macro- and micro-level activities to open the identified "black box," i.e. the interplay between these sites' DT activities. Analysing these interplaying activities, I inferred the notion of co-enactment. Accordingly, organisational DT, in all its three areas of concern (Vial 2019), becomes co-enacted through DT activities at the organisational macro and micro levels. This notion offers two implications. Firstly, it not only challenges the duality of macro- and micro-level activities but also proposes to understand and study them as one interplay. Therefore, I argue for analytically zooming between the macro and the micro. Secondly, it proposes to study DT employing a process perspective on change. Next, I elaborate these implications for DT research.

Resolving the Duality of Macro- and Micro-level Digital Transformation Activities

The discussion on the interplay between organisational macro- and micro-level activities is not entirely new. Orlikowski and Robey (1991), e.g. conceptualised the structuration of technology through macro- and micro-level activities in a reciprocal relationship. Further, the practice turn in organisational and IS research emphasises that micro-level practices constitute macro-level phenomena. Conversely, it postulates that macro-level phenomena originate from practices (Schatzki et al. 2005). Yet, while prior literature has acknowledged the reciprocal relationship between macro- and micro-level activities, it has emphasised that they constitute and influence each other. With its empirical analysis, this treatise introduces this discussion to DT research. More importantly, however, its conceptualisation of co-enactment of DT moves beyond understanding macro- and micro-level activities to be in a reciprocal relationship of being separate but related. Rather, it grasps DT as becoming

co-enacted in an inseparable interplay of framing and concretising. While macro-level activities frame DT through mechanisms of spacing and projecting, micro-level activities concretise it through mechanisms of proposing and realising.

The co-enactment perspective emphasises that we must conceive and study framing and concretising activities as one inseparable interplay. How then shall we understand DT's becoming, if we only focus on its framing or its concretising? Studying its framing, we may understand how organisations define the broader rules and resources (and what rules). Investigating its concretising, we may grasp how specific interactions, under local conditions, constitute macro-level phenomena. Yet, both foci miss out on theorising the other. The first seems to neglect phenomena's manifestation in micro-level activities and their enactment of the macro-level. The second tends to overlook the broader rules that macro-level activities provide and seeks answers in local conditions of specific interactions. Against the surfaced interplay of macro- and micro-level activities, neither of the two foci can fully explain how organisational activities enact DT. Hence, while my findings corroborate existing research on macro- or micro-level activities, they extend DT research introducing the concepts of framing and concretising to capture the notion that DT becomes in an inseparable interplay of co-enacting macro- and micro-level activities. If we study organisational DT, these concepts remind us to analytically ask how macro-level activities frame micro-level activities and how micro-level activities concretise macro-level activities, as well as how, if assembled as one, they jointly co-enact the phenomenon of DT. Thus, the underlying mechanisms offer concepts to dissect and explain macro- and micro-level activities' interplay.

The notion of co-enactment challenges our conception of macro- and micro-level activities as dualities. Studies on DT have investigated the "either/or" relationship, although scholars have argued for obtaining a mixed-level or balanced view on macro- and micro-level activities that enact organisational phenomena (Leonardi and Barley 2010; Markus and Robey 1988). Taking a mixed-level perspective, this dissertation breaks with the duality of macro- and micro-level activities in DT research and puts forth the notion that DT becomes through co-enactment. To reveal this co-enactment, it plays with its analytical zoom. It moves from macro- to micro-level activities and across different focal sites, adjusting its focus to the respective levels and sites to unpack their conceptual links. This piecemeal process revealed that, while dualities may facilitate analysis, organisational life is hardly that simple. Organisational phenomena, such as DT and its enactment, are rather complex. If we intend to understand them in their complexity, the notion of co-enactment through framing and concretising implies that we must not take macro- and micro-level activities as dualities with a reciprocal relationship, but as one interplay. Metaphorically, scholars investigating DT should zoom in and out adjusting the granularity of their analysis fluidly. Zooming, each setting – as with cameras – requires respective

configurations in focus to sharply capture pieces of the collage of activities that enact organisational life. Thus, through analytical zooming – adjusting granularity, configuring focus and revealing the collage – scholars can reveal the organisational phenomenon which the multi-level organisational activities co-enact. Considering DT’s co-enactment, scholars should study DT as an emergent mixed-level phenomenon. That is, when focusing on micro-level activities’ concretising, they should theorise and consider the broader rules and resources found in macro-level activities’ framing. Similarly, when studying macro-level activities’ framing, they should consider the micro-level activities’ concretising and these activities’ local conditions which underlie the macro-level activities. Analytical zooming can assist them in setting their focus on DT activities at the macro and micro levels to reveal their interplay and its co-enactment of DT.

Adapting a Process Perspective on Digital Transformation Activities

The conceptualisation of co-enactment suggests adapting a process perspective in studying DT. According to Wessel et al. (2020), DT is conceptually different from IT-enabled transformation for it alters organisations’ value proposition and identity. This definition of DT conceives transformation phenomena as DT, if they include a change in two organisational entities: value proposition and identity. It thus assumes a perspective on change grounded on entities (van de Ven and Poole 2005). However, this entity perspective on change is problematic for DT research as it limits us to assess transformation phenomena as DT only in hindsight. That is, when a transformation is completed, we can determine whether it altered value proposition and identity and then subsume it was (or was not) a DT. With its observation of AutoCo shifting its strategy to remain an automaker (see article III), this dissertation identifies the problematic nature of this entity perspective for conceptually differing DT and IT-enabled transformation.

If strictly applying Wessel et al.’s (2020) definition, we may not consider AutoCo’s transformation process a DT. AutoCo may have altered its value proposition (e.g. developed and launched digital services), but not its organisational identity. The automaker eventually decided to strengthen its automaker identity. Yet, if we assume this conceptual position, how would we conceive of AutoCo’s organisational activities up to its strategic shift? Would we consider them to be DT, or would we patiently wait until the organisation declares its transformation process completed to then assess whether it altered value proposition and identity? Further, if we only categorise organisational transformations as DTs once we can assess that both value proposition and identity changed, how would we determine “failed” DT processes? That is, would they be “failed” DTs if they lack a changed value proposition or identity, or would we decide to not categorise these instances as DT in the first place? If

we were, however, to adapt Wessel et al.'s definition within a process perspective on change, we may also conceive organisational activities that address or intend to alter value proposition and identity as DT.

The process perspective on change allows us to study transformation processes as DT which may eventually become otherwise. While we may eventually not consider these transformation processes as DTs (or at least not as successful DTs), we can study the path of such transformations to understand how (and why) these organisational transformations, that set out to become DTs, became otherwise. Taking this process perspective, AutoCo's organisational activities prior its strategic shift co-enacted a DT. They co-enacted processes intended to produce an altered value proposition and identity. This perspective thus allows for studying transformational processes as DT, if the underlying activities seek to co-enact changes to value proposition and identity. On the other hand, if we strictly apply the entity perspective, we may study such activities as co-enacting a transformation process but could only claim to have studied DT once we can establish that they indeed altered value proposition and identity. The latter would confine DT research to studying the phenomenon solely in hindsight, thus restraining us from generating invaluable insights into its processual unfolding. The interesting question the process perspective thus poses is how (and why) AutoCo's transformation activities became DT (or otherwise). Generally put, it asks how (and why) organisational activities co-enact DTs and how (and why) such activities may become otherwise. Taking this perspective, we may thus find answers to the above posed questions and deepen our understanding of how DT becomes through the co-enacting interplay of organisational macro-and micro-level activities.

In conclusion, this dissertation sought to explore how organisational macro- and micro-level activities enact DT. The empirical analysis yielded a conception of organisational DT becoming co-enacted through an interplay of framing activities (at the macro level) and concretising activities (at the micro level). This section has outlined implications of this co-enactment perspective for DT research. Most importantly, it stresses that DT is a mixed-level phenomenon and that we need to observe research approaches suitable to study the inseparable interplay of organisational activities which co-enacts DT. Moreover, it argues to adapt a process perspective when studying DT. An entity perspective, as implied in Wessel et al.'s (2020) definition of DT, may confine us to only determine transformational phenomena as DT in hindsight. A process perspective, however, warrants studying activities intended to co-enact DT as well as studying the phenomenon as it unfolds regardless of whether it eventually alters value proposition and identity.

6.3 Implications from and for the Theoretical Angles

Besides the notion of co-enactment, this dissertation draws implications from and for the theoretical angles underlying its enquiries into its three research sub-questions. Implications *from* these theoretical angles are perspectives which they introduce to DT research. Implications *for* these theoretical angles are inferred from the empirical phenomenon of DT. In this section, I outline these implications from and for the theoretical angles in the sequence in which they underlie the research sub-questions: organisational improvisation, organisational institutionalism and digital infrastructures.

6.3.1 Implications from/for Organisational Improvisation

This dissertation extends the concept of minimal structure twofold. First, minimal structuring can hone and exploit organisational improvisation. Second, the concept can explain the interplay of organisational macro-level activities and micro-level improvising. DT research has focused on organisations' dynamic capabilities to address their DT (e.g. Karimi and Walter 2015; Yeow et al. 2018). Within this resource-based view, El Sawy et al. (2010) have argued for a third type of capability. They propose that, while dynamic capabilities help firms address anticipated changes in their business environment, they require improvisational capabilities to master unanticipated changes. Organisations should thus develop improvisational capabilities.

Organisational researchers have long been interested in the development of organisations' improvisational capabilities (e.g. Crossan 1998; Vera and Crossan 2004). They have suggested techniques, trainings, and deliberate improvisation to hone and nurture organisational members' improvisation skills. This dissertation suggests that minimal structuring offers a technique for both honing and exploiting organisational improvisation. Minimal structuring refers to organising deliberate acts of organisational improvisation at which a challenge or theme links macro- to micro-level activities. It hones improvisation capabilities as employees learn the trait by practice. It exploits improvisation capabilities as employees improvise to develop ideas concretising the organisations' macro-level activities. Minimally structured acts of organisational improvisation can thus both develop and exploit organisations' improvisational capabilities.

Minimal structure can explain the interplay underlying mixed-level phenomena. Organisational improvisation has a long research tradition in IS. Orlikowski introduced organisational improvisation to studies of organisational change and IT, portraying change as "an ongoing improvisation enacted by organizational actors trying to make sense of and act coherently in the world" (1996, p. 65). Similarly, Ciborra (1996) argued that the practice of improvising better reflects organisational life than

the image of actors strictly following ostensive routines. Moreover, da Cunha et al.'s (2003) study illustrated how actors repair breakdowns in organisational life via improvising. Unlike the resource-based view, which focuses on the organisational macro level, these studies have taken improvisation to the micro level. Thus, organisational improvisation offers conceptual perspectives to study both organisational DT activities at both the macro and micro levels. This dissertation extends organisational improvisation to a mixed-level perspective. It especially extends the concept of minimal structure to not only guide micro-activities of organisational improvisation but also capture and explain the interplay of macro- and micro-level activities and their co-enactment of organisational phenomena.

6.3.2 Implications from/for Institutional Theory

The institutional perspective underlying the second sub-question draws attention to issues of DT and legitimacy (cf. Hinings et al. 2018) as well as deinstitutionalisation. Organisational institutionalism does not necessarily explain rational (in an economic sense) but also irrational decisions and choices over DT (Greenwood et al. 2008; Meyer and Rowan 1977). Indeed, its power rests in explaining why organisational actors make choices which seem economically irrational over others. Scholars refer to these as rationalised myths, i.e. choices which have become rationalised for being considered appropriate within an institution's belief system (Meyer and Rowan 1977). Applying this perspective to DT research, this dissertation's findings suggest that the activities enacting DT are not necessarily economically rational activities. Rather, activities which organisational actors consider legitimate activities – appropriate – to enact DT. This legitimacy is linked to macro- and field-level ideas about DT. For example, AutoCo grounds its rationale for its digital workplace transformation on institutional factors. These factors stem from societal, economical and organisational elements. Responding to these factors, the car manufacturer adapts the logic underlying tech companies and start-ups' digital activities. It assumes these as legitimate activities for DT, i.e. activities which stakeholders, employees and society at large may consider appropriate rather than questioning whether these activities are economically rational. Acknowledging that not economically rational but considered legitimate activities co-enact DT flips how we should conceive respective DT activities. That is, organisations' DT activities do not necessarily present good (or best) practice but rationalised myths instead. We should then not study economically grounded blueprints for DT but organisations and their field's rationalised myths – what they consider and perceive as appropriate – on how to enact DT. Hence, we need to critically reflect whether we study organisational actors' economically rational choices or rationalised myths. Both contribute to our understanding of DT. Yet, depending on which one we study, we can either infer best practices or

what actors consider legitimate DT activities in their organisation or organisational field.

Deinstitutionalisation, unlike its counterpart institutionalisation, is a scarcely studied concept in organisational institutionalism (Greenwood et al. 2008). This dissertation's findings foreground erosion of established practices over institutionalising new practices. It illustrates that deinstitutionalisation offers an adequate theoretical angle to study this abandonment. It highlights the significance of abandoning the old for nurturing change (cf. Greenwood and Hinings 1996). Conversely, DT provides an interesting and relevant empirical phenomenon for theorising and, thus, developing our understanding of deinstitutionalisation. In this regard, this dissertation extends the concept with its conceptualisation of archival records constructing certain workplace practices as delegitimate triggering their erosion.

6.3.3 Implications from/for Digital Infrastructures

The contributions to the third sub-question provide two implications for digital infrastructure research. First, they flip the concept of infrastructure drift. Second, this flipped view challenges existing infrastructure governance models. The enquiry into the digital jungle concept challenges the conception of infrastructure drift. Ciborra and Hanseth (2000) theorised that evolving infrastructures tend to drift – move away – from management control. This theorisation assumes that managerial actors control infrastructures. AutoCo's digital jungle, however, indicates that managerial macro-level activities for cultivating a digital infrastructure can flip infrastructure drift. Instead of solely drifting from management control, the car manufacturer's digital infrastructure drifted also from users, their grasp and use. Thus, digital infrastructures seem to not only be subject to managerial but also user "control." User control refers to their grasp of a digital infrastructures' action potentials and ability to actualise these potentials. The digital jungle being "a shared experience of a digital infrastructure having evolved into an impenetrable technological thicket that stashes its affordances, impairing both its effective use and management, yet, furnishing undiscovered potential" (Zimmer and Niemimaa 2020, p. 6) impedes this ability. This urges us to rethink the assumption of infrastructure design and evolution being a sole matter of management control and to acknowledge employees not only as users but co-designers (cf. Hanseth and Lundberg 2001; Pipek and Wulf 2009). In essence, this first implication challenges infrastructure governance.

Digital infrastructure governance models should accommodate users as co-designers. Discussions on digital technology altering IT governance are not new. Gregory et al. (2018) presented similar findings on the consumerisation of IT modifying employees' relationship to technology. They showed how this changed relationship gradually alters IT governance. Studying infrastructure governance, Constantinides

and Barrett (2014) proposed a polycentric approach. AutoCo's DT processes sought to empower employees to freely choose the digital technologies they required for their work. It invited them to become co-designers of the digital infrastructure. The findings illustrated how this invitation initiated an interplay of macro- and micro-level activities cultivating AutoCo's digital infrastructure for collaboration in a digital jungle. Yet, rather than building stricter infrastructure governance, this observation underpins the proposition for new infrastructure governance models that acknowledge users as co-designers. If the emergence solely originates from macro-level activities, managerial actions could mend it. If it is solely grounded on employees' micro-level activities, stricter enforcement of existing rules may offer solace. However, being co-enacted, it stresses the need for infrastructure governance which better involves users as co-designers. Constantinides' and Barrett's (2014) polycentric approach may offer a starting point for this endeavour.

6.4 Practical Implications

Despite its conceptual focus, this treatise also offers practical implications. Since qualitative research and its findings are contextual, practitioners should read these practical implications not as prescriptions but as considerations for DT. These considerations stem from my observations and the underlying empirical material presented in both this treatise and its underlying articles. This section presents them as bullet point lists sorted into the three areas of concern.

Practical implications for DT strategy:

- *Ensure minimal structuring of bottom-up activities:* DT is based on participatory approaches which can motivate employees to go with the change. Organising dedicated events for these bottom-up activities taking an approach of minimal structuring can better tie employees' participation to an organisations' overall strategy. Minimal structuring (e.g. through posing an ideation challenge, offering a theme or outlining organising principles) can guide their bottom-up activities to contribute toward the organisation's strategic direction.
- *Create organisational structures for intrapreneurship:* Employees engaging in DT strategy making also observe other organisational tasks. They become intrapreneurs alongside their "actual" job. This can create hindrances if organisations do not facilitate intrapreneurship by creating respective supportive structures. Thus, if relying on employees' business ideas to manifest the organisational DT strategy, organisations should create structures facilitating intrapreneurship.

Practical implications for organisational change:

- *For organisational change, identify and remove undesired artefacts:* Artefacts inscribe workplace practices and processes (e.g. IS, policies or process templates). For example, the hierarchical tendency of an organisational culture can be inscribed into its workflows requiring superiors to approve of their employees' actions. Identifying and replacing (or even removing) these artefacts creates a void which can induce negotiations over related workplace practices and processes. If practices and processes should be changed as part of DT, removing the artefacts that exert these practices and processes can thus trigger their erosion.
- *Improve digital units' strategy shift resilience:* In their organising, digital units tend to draw on institutional logics grounded on the organisational fields of start-ups and tech companies. The findings suggest that digital units face little pressure when an incumbent organisation's strategy emphasises DT. Yet, when it shifts back to its traditional business, digital units receive increasing pressure on their organising which can even cause their closure. This suggests that, for long-term DT, digital units should improve their resilience to strategic shifts by combining institutional logics such that they can illustrate their value creation in terms legitimate within the logic of their organisation's traditional business.

Practical implications for digital technology (digital infrastructures):

- *Involve employees in cultivating digital infrastructures for collaboration:* The consumerisation of IT and the attributes of digital technologies have eased employees' access to digital technologies for collaboration. In this vein, this my research indicated that employees engage in cultivating the digital infrastructure. Yet, uncoordinated cultivation can result in security issues and barriers to collaboration. This study's findings suggest that, instead of regulating employees' cultivation activities, organisations should find new governance modes which include employee involvement in cultivating their digital infrastructures for collaboration.
- *Provide guidance for digital infrastructure access:* Users can struggle with the rapid cultivation of a digital infrastructure for collaboration. Since extending the use of digital technologies is central to the notion of DT, organisations should take measures to facilitate users in keeping up with, identifying and gaining access to their digital infrastructure for collaboration. Article IV thickly describes one such approach at AutoCo.

Lastly, organisational DT not only becomes through activities at organisations' macro or micro levels. In addition, field-level activities and events play a decisive

role (e.g. market entries, digital disruptions). Hence, organisations should be vigilant about activities in their organisational field. Particularly, they should be wary of DT, both their own and that of their organisational field, shifting identity and value creation resulting in spanning of organisational fields. Organisations’ capabilities to react to both anticipated and unanticipated dynamics at the field level are thus crucial for enacting their DT.

6.5 Authenticity, Plausibility and Criticality: Evaluating this Research

The craft of science demands that we critically assess the way we have acquired knowledge. To assess scholarly work, researchers have thus suggested various criteria. The criteria applicable to evaluate a study depend on that study’s research approach. I have taken an interpretive research approach and collected qualitative material employing the methodology of ethnography (see 3 Research Approach). For assessing such work, I have outlined different sets of principles and criteria which scholars have recommended for interpretive research and ethnographies (see Table 8 in 3.1.3 Principles for Interpretivist Research Approaches). In Table 14, I provide evidence from this treatise and its underlying articles that the presented ethnography fulfils the requirements and criteria of high-quality ethnographies (Golden-Biddle and Locke 1993; Schultze 2000). Evaluating this treatise’s authenticity, plausibility and criticality, I establish that it reconstructs a credible and genuine account of my field experience and the linked theoretical explanations (Walsham 2006).

Table 14. Evaluating this research against the criteria of authenticity, plausibility and criticality

Requirements	Evidence provided in this treatise and underlying articles
Authenticity	
Everyday life as lived by members of the field	The treatise and the underlying five articles provide details on AutoCo, its members and their everyday life experiences of AutoCo’s DT activities.
Field members’ lingo, i.e. everyday language	Writing this ethnography, I have incorporated the vernacular of the field members to demonstrate that I have indeed been immersed at AutoCo. However, the possibility of including unique terms (i.e. terms traceable to AutoCo) was limited due to the requirement of sufficiently anonymising the ethnographic accounts prior to publication.
Field members’ thoughts on life in the field and/or the field itself	In the five underlying articles I present vignettes or excerpts from raw data (i.e. field notes, interview transcripts) which demonstrate and present field members’ thoughts and views on AutoCo’s DT and DT more generally.

Table 14 continued.

Authenticity (continued)	
Who the ethnographer talked to and observed	The research approach chapter outlines whom I observed and talked to both informally and formally. For example, I formally interviewed managers and employees of AutoCo's digital strategy unit for article I, while for article II, I interviewed employees informally. It provides details about how my material was constructed and collected across multiple sites and from various field members. Articles IV and V, e.g. examined the digital strategy unit and employees in various other units.
The nature of the researcher's relationship with people in the field	The research approach chapter provides details on my entrance to the field and how it forged my field identity as "one of them." Further, it elaborates on how my field identity placed me in a participatory position with obligations similar to members of the field. For example, it includes my description of the continuous negotiation for informal access with my managers or my reception as a peer and expert on DT amongst colleagues and employees from different units.
The response of others on the scene to the researcher's presence	In the research approach chapter, I provide details on field members responding with curiosity to my research role and sharing their views and thoughts on AutoCo's DT process. Moreover, I describe how my colleagues treated me as a peer and consulted me on DT issues.
Researcher's pre-understanding of the field and the studied scene	In the research approach, I provide details on my background, i.e. my previous work experience with AutoCo and, thus, my familiarity with the field. However, I also describe how I had to take the "school bench" for the role of an internal organisational development consultant.
Researcher's interest in the scene	In the research approach, when describing my entrance to the field, I explain how my previous work experience at AutoCo and my resulting interest in the automotive industry, but also the industry's challenges which formed my decision to study DT at a car manufacturer. The selection of AutoCo was then, as described in the research approach, also a matter of chance with the company tendering the split-work position.
Details on the research process	In the research approach, I state that I entered the field in July 2017 and exited in June 2020 (i.e. three years in the field). Further, I outline the research process by its three phases: entrance to the field, in the field, and exit. I describe how I negotiated access (i.e. via a tendered position), the participatory role I took during field events, and how I returned from the field (i.e. the tendered position having ended). Moreover, I elaborate on my field note practices, construction and collection of empirical material and how my participant observations depended on the field events and my consultant work.
Providing representational material (e.g. excerpts from field notes, documents, or interviews)	All articles rely on my field notes, the collected archival records and digital data, and interview transcripts. Hence, I present, in all articles, representational material (i.e. verbatim quotes from this material) when I reconstruct my field experience for readers.

Table 14 continued.

Authenticity (continued)	
Relationship between the fieldnotes and the written-up ethnography	The research approach describes how I relied on my field notes to relate my observations to each other and to theoretical descriptions. I also outline how I translated field notes through iterative rewriting into narratives and tales of the field. For example, article I presents a vignette of AutoCo's ideation events originating from my field notes. In article II, I relied on my field notes to demonstrate the deinstitutionalisation of workplace practices through vignettes of manager–employee negotiations over certain workplace practices.
Conduct <i>post hoc</i> respondent validation	The research approach describes how my managers at AutoCo had to approve all articles before publication. Further, I elaborate on how I presented my research findings and conclusions, but also shared my articles with colleagues and employees at AutoCo.
Plausibility	
Adhering to academic writing conventions	This treatise and all underlying articles adhere to the writing conventions for the respective kind of publication. This treatise follows the structure of dissertations in IS and all articles have a "title," "abstract," "keywords" and sections on the studies' theoretical background, research approach, findings and discussion. Moreover, in the research approach, I provide my rationale for following the convention of realist tales (Leonardi and Barley 2010; Markus and Robey 1988) for their fit with the writing style in IS outlets.
Justifying the research and differentiating its contribution by situating it within ongoing research streams or presenting theoretical novelty	The introduction highlights shortcomings in existing research on DT limiting our understanding to the macro level. In the chapter on informing literature, I then outline three different research streams as areas of concern within DT. The subsequent chapters' structure reflects these three areas of concern. For example, the findings chapter presents my observations on these areas of concern. The treatise closes with a discussion which highlights its contribution to each of the three areas of concern. It presents a substantial contribution to DT research by postulating and offering concepts to understand organisational DT as a process co-enacted through organisational macro- and micro-level activities.
Normalising atypical research conditions and aligning the findings with common, everyday experiences	Given the automotive industry's presence in society and AutoCo being part of major stock market indices, I assume that little of the described organisational life is atypical to readers in the sense put forth by Golden-Biddle and Locke (1993). Nonetheless, in this treatise and its articles, I relate my observations to wider societal (e.g. the changing concept of mobility) and organisational issues (e.g. new work) to align them with readers' everyday experiences.

Table 14 continued.

Criticality	
Inviting readers to pause and think about specific observations	In the discussion and conclusion, I invite readers to pause and reflect on specific conceptualisations. Further, I provide thick descriptions of the field which allow readers to examine and critically reflect specific observations and the conclusions I have drawn. For instance, article II invites readers to think about why DT mostly involves narratives of establishing new practices and technologies when change implies that existing things must erode.
Provoking readers to answer questions	In the discussion chapter and in the five articles, I have used this strategy to challenge readers to question the assumptions of prior literature on the phenomenon of DT. For example, article II invites readers to assume an emergent perspective opposed to a technology imperative for DT. Similarly, article V proposes a set of provocative questions to invite readers to think about the title's oxymoron of "cultivating a digital jungle."
Guiding readers through imagining ways of thinking and acting differently	Throughout this treatise and within the underlying articles, I have built on this strategy when offering new ways of thinking about the macro- and micro-level activities that enact DT; the rationale organisations construct for their DT (e.g. article II); the role of ideation events for DT strategy (e.g. article I); and how DT alters the evolutionary process of digital infrastructures into a drift not only from management but also users (e.g. articles IV and V).
Cultural juxtaposition	Originating from anthropology, this requirement literally means juxtaposing cultures. In the context of organisational ethnography, however, I have also understood this criterion as juxtaposing known with unknown ways of organising. In this sense, I provide thick descriptions of the field which serve as grounds for readers to juxtapose their own everyday experiences, especially on DT within their organisations, to the ones I reconstruct within these pages. In addition, the research site description juxtaposes the car manufacturer's development of cars with that of developing digital technologies. Similarly, article III juxtaposes the institutional logics of AutoCo's traditional business and two of its digital units.

Table 14 provides evidence that this research fulfils the requirements of all three criteria – authenticity, plausibility and criticality – of high-quality ethnographies.

7 Conclusion

In this dissertation, I have examined both the organisational macro- and micro-level activities that enact the phenomenon of DT. The main motivation for this enquiry was existing research's emphasis on either a macro- or micro-level perspective on DT despite calls for studying organisational transformation as mixed-level phenomena (Leonardi and Barley 2010; Markus and Robey 1988). Vial (2019) structured existing DT research into three areas of concern: DT strategy, organisational changes and digital technology. Structuring my enquiry into these three areas of concern, I have taken an ethnographic approach to study a single organisation's macro- and micro-level activities that enact the subject under study in each of these three areas of concern. Specifically, I studied an incumbent car manufacturer – AutoCo – which had begun its DT journey. In the field, I focused on multiple sites at AutoCo – both at the organisation's macro and micro levels – to reveal the enactment of the company's DT across these sites. The analysis of my empirical material builds on three different theoretical angles: organisational improvisation, organisational institutionalism and digital infrastructures. With its mixed-level approach, findings and conceptualisations, this dissertation contributes to DT research.

7.1 Primary Contributions

This dissertation's primary contribution is its conceptualisation of the interplay of DT activities at the macro and micro levels co-enacting DT. To understand and explain this interplay, it offers the concepts of framing and concretising. Macro-level activities frame by creating space and projecting direction for DT. Micro-level activities concretise by proposing and realising manifestations for DT. Accordingly, DT becomes co-enacted in an interplay of macro-level activities framing (by spacing and projecting) DT micro-level activities, and micro-level activities concretising (by proposing and realising) DT macro-level activities. This perspective of co-enactment takes a mixed-level view on the organisational activities that enact DT rather than stressing either macro- or micro-level activities. Indeed, in all three areas of concern, this dissertation's findings illustrate how DT becomes through co-enactment and suggest the interplay of macro- and micro-level activities as being inseparable.

Hence, neither organisational macro- nor micro-level activities can solely explain the phenomenon of DT but only a consideration of their interplay.

Further, this dissertation contributes to DT research taking a research-up perspective. Thus far, research has focused on managerial views on DT and respective organisational activities. The underlying ethnographic field study investigated DT from an organisation's bottom rather than "being with the chiefs." This dissertation thus extends the prevailing managerial views on DT to employee voices, views and accounts.

Moreover, it contributes to the selected theoretical angles. Firstly, it extends organisational improvisation's concept of minimal structure to IS strategy research and suggests minimal structuring as a technique for both honing and exploiting organisations' improvisational capabilities. Secondly, its institutional perspective highlights the importance of understanding DT activities in terms of their legitimacy, i.e. as rationalised myths. Further, it introduces the concept of deinstitutionalisation to research on DT. It shows how organisations trigger deinstitutionalisation through narratives that delegitimise established practices. This illustrates that DT is an apt empirical context for further theorising this concept which is the understudied second side of the otherwise well-studied coin of institutionalisation. Lastly, the enquiry into digital infrastructures foregrounded two primary contributions. Firstly, infrastructures cannot only drift from management control but also from users' grasp, which challenges existing digital infrastructure governance. Secondly, the concept of work infrastructures deserves more attention for their role in cultivating new work practices for DT.

The thrust of this dissertation has concentrated on improving our theoretical understanding of DT. Nonetheless, the thick descriptions and findings of AutoCo's DT also offer practical implications. Most significantly, this study highlights the role of the interplay between organisational activities at the macro and micro levels co-enacting DT. Thus, managers should pay close attention to the coherence between these activities as they frame and concretise their organisations' DT. Further, the findings indicate the importance for incumbent organisations to abandon the established for organisational change in general and in particular DT. This means, managers should acknowledge their organisations historical as well as cultural context and deliberately delegitimise elements which they consider barriers to successful transformation.

7.2 Future Research

While research answers questions, it often ends posing others. Accordingly, this dissertation offers insights into organisational activities and their co-enactment of DT but also suggests questions for future research. Next, I build on my findings to

outline angles for future research in each of the three areas of concern in organisational DT research. Further, I argue for research approaches conducive to study DT as a mixed-level phenomenon. Lastly, I encourage scholars to question the assumptions underlying incumbents' DT.

Researchers have suggested improvisational capabilities as a third type of IT capability (Pavlou and el Sawy 2010; el Sawy et al. 2010). They proposed that this third type may facilitate organisations to account for unanticipated changes. This study found that AutoCo organised its ideation events to encourage employees to improvise on business ideas that could manifest the organisation's DT strategy. Yet, improvisational capabilities may not only be helpful to generate strategic ideas at ideation events but also to overcome hindrances in daily business operations (da Cunha et al. 2003). Thus, future research could investigate whether planned, event-based improvisation (Hadida et al. 2015) can build improvisational capabilities at the individual, group or organisational levels. Crossan (1998), e.g. suggests this similarly with her guidance on improvisation trainings (cf. also Vera and Crossan 2004). Moreover, future research should delve into the efficiency of developing business ideas through acts of organisational improvisation. While this study has improved our understanding of how AutoCo links such acts to its DT strategy, it leaves us with the question of this approach's efficiency, that is, e.g. comparing this approach in its outcome of valuable digital business ideas to dedicated digital units developing such ideas or acquiring start-ups. Hence, future research could delve into, firstly, whether planned event-based improvisation can build improvisational capabilities and secondly, the outcome of these events in regard to digital business ideas.

Delving into organisational change, this study revealed that organisational actors co-enact DT as a strategic and organisation-wide change. It has focused on this co-enactment instilled in AutoCo's macro- and micro-level activities that implement organisational changes. While its findings indicate traces of inertia, its analytical focus lies elsewhere. Our interest in organisational change, however, is largely grounded on the phenomenon of inertia (Besson and Rowe 2012). The findings on digital units combining elements of different institutional logics illustrate inertia in the background (i.e. article III). That is, when AutoCo's strategy emphasised DT, the digital units faced little inertia from the traditional business. Yet, once the strategy shifted, the traditional business sails inflated, and the digital units started experiencing inertia. They experienced this inertia, however, not at the grassroots level of AutoCo, but with managerial actors questioning the appropriateness of the digital unit's activities to avert the traditional business' crisis. This managerial inertia in the context of organisational change for DT thus warrants future research's scrutiny.

The findings on the digital jungle suggest that digital technology traverses the IT function to increasingly become a major concern of business units. DT seems to entail a shift in business units' conception of digital technology; it shifts from

something that the IT function provides to something that is integral for their business success. We can see this in their activities cultivating business managed IT systems (Klotz et al. 2020). The digital jungle, however, indicates that business units are indeed not enacting single business-managed IT systems but cultivate digital shadow infrastructures. The question for future research then is how to best govern digital infrastructure cultivation. Gregory et al. (2018) indicated that new governance models may be required to master, what they call, the consumerisation of IT. These models should possibly better involve employees and users in digital infrastructure cultivation, e.g. through polycentric governance modes (Constantinides and Barrett 2014). Moreover, while this dissertation offers insights into AutoCo's digital infrastructure evolving into a digital jungle, it deals little with the cultivated digital infrastructures impact on the company's DT outcome. That is, does cultivating a digital infrastructure for collaboration improve internal collaboration, and if so, also innovativeness? Both the question of cultivation governance and digital infrastructures' role in organisations' DT outcome are relevant angles for future research into user-oriented digital infrastructures (Hanseth and Lundberg 2001; Pipek and Wulf 2009).

Overall, with its co-enactment perspective, this dissertation suggests that future research on DT should observe research approaches conducive to study mixed-level phenomenon. While I have taken an ethnographic methodology with a research-up position in the field (Eberle and Maeder 2016), other researchers may choose a different methodology and research design. For example, future research may take both a research-down and -up position. That is, researchers may collect first-hand empirical material at the organisational macro and micro levels to study the co-enactment of DT. To ascertain this material synchronically, we may need research settings in which multiple researchers enter the field – the same organisation – at different levels and sites to afterwards combine their field experiences and empirical materials in order to reconstruct the network of activities that co-enacts certain organisational phenomenon. Thus, in order to improve our understanding of the phenomenon of DT, future research should closely consider its research approaches to heed the phenomenon's mixed-level nature. Since this is a single-site study (as typical for ethnographies), scholars could also consider a multi-case design to conduct a comparative analysis of co-enactment in different organisational contexts. Similarly, future research should consider activities at the organisational field level. That is, while this dissertation conceptualises intra-organisational activities as co-enacting DT, its findings also suggest that field-level activities interplay with these organisational activities. Thus, future research could improve this dissertation's conceptualisation by extending its theorising to DT activities at the field level.

Lastly, future research should move beyond reconstructing our assumptions of DT and start questioning them. When I left the field, AutoCo's executive management was in the midst of resetting the organisation's strategy. With the car

manufacturer's profitability decreasing, its executive management decided to lessen its promotion of the vision of becoming a mobility service provider but to stay true to its roots: manufacturing cars. This strategic reset poses interesting and, most importantly, relevant questions for future research. AutoCo is an incumbent in its field. With the automotive industry entering DT, its executive management believed that the direction to take was to become a mobility service provider, a tech company. Indeed, the car manufacturer shifted its hiring focus from mechanical engineers to software engineers for its DigiCar strategy. Obviously, not all organisational members considered this the best direction for AutoCo's future. Yet, AutoCo's DT strategy envisioned infusing AutoCo's products with the digital, developing digital business models and, in the long term, shifting its identity from a pure car manufacturer to a tech company and mobility service provider. Its reset of this vision suggests that we need to question the assumptions underlying DT in incumbent companies. That is, practitioners and academics alike seem to assume that incumbents must digitally transform themselves, their value offering, business model and identity. AutoCo, with its Auto2020 and DigiCar strategies, had embarked on actions based on these assumptions. Yet, resetting its strategy back to its roots, the car manufacturer seems to have questioned this path. Hence, like AutoCo, we should pause and question our assumptions of DT. This generates more questions. Does DT require all incumbents to alter their value offering and identity? Is this assumption chained to incumbents' value offering? That is, are some value offerings more prone to alter due to digital technologies compared to others? For example, can we infer from the downfall of Nokia or Kodak that something similar may occur for car companies? Can we compare the product features of mobile phones and cameras with those of passenger cars and commercial vehicles? If yes, we may either live in a world without cars because technology may alter mobility such that cars become obsolete, or other companies – presumably nowadays tech companies – must start manufacturing cars. We can already see a glimpse of the latter in Waymo or rumours about an iCar or GoogleCar. In this case, what phenomenon of change does this enact: tech companies transforming their digital business by infusing it to become more physical? Plus, in what position will it place incumbents when tech companies start on a similar journey (i.e. leaving their home turf to expand their business)? Some of these questions are provocative, and their answers may at first seem obvious. Yet, let us pause and ponder: what do we – as researchers – risk, if we do not ask these questions? Is it not the objective of research to question? After all, critical reflection and constructive critique is what makes this world move forward. Future research should therefore engage in answering these questions to critically reflect the assumptions underlying organisational DT activities rather than to simply reconstruct them.

Abbreviations

AutoCo	The research site – a large European car manufacturer
Auto2020	AutoCo's digital transformation programme focusing on its organisational culture and internal processes
CDO	Chief digital officer
CEO	Chief executive officer
CRM	Customer relationship management
CVDU	Commercial vehicles digital unit
DigiCar	AutoCo's digital transformation strategy focusing on its value creation
DT	Digital transformation
DTO HR	Digital transformation office human resources
EU	European Union
ERP	Enterprise resource planning
HR	Human resources
IS	Information systems
IT	Information technology

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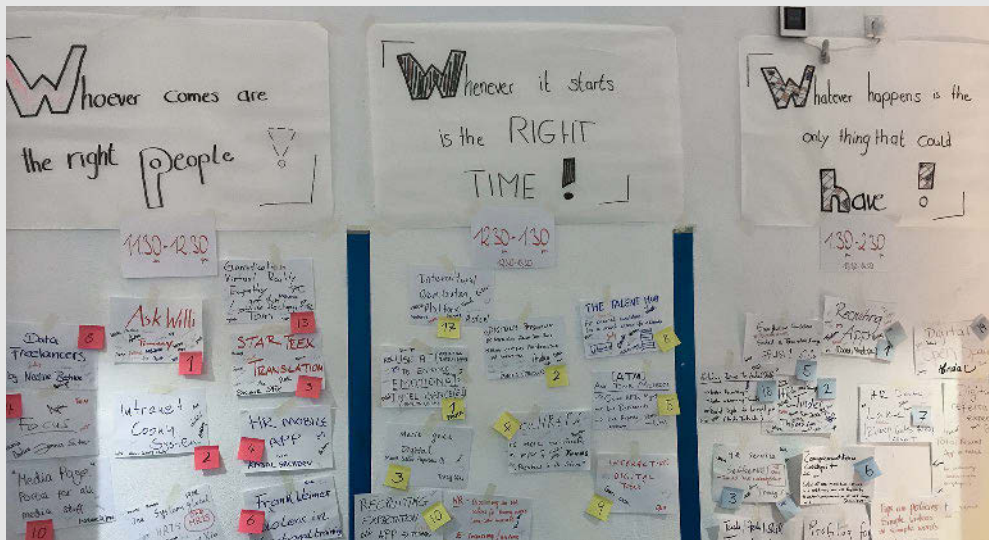
Appendices

Appendix 1. Illustrating Empirical Material for all Five Underlying Articles

Field Note in Relation to Article I: Improving Digital Transformation

[15/03/2018 Field note: Participant observation at an internal ideation event]

Afterwards, the moderator asked everyone who wanted to share their ideas to share them with the group and post them to a wall with three different time slots for the day. Participants were then asked to select ideas they would like to work on in the different time slots. In total, 50 ideas were pitched and posted to the wall, and three sessions of ideation were conducted. During the ideation sessions, no rules were enacted or imposed. However, three mantras were written on posters above the wall of ideas (see picture below). This means that everyone was allowed to do as they pleased, including participating in one idea only, not participating at all or roaming around and contributing to several ideas. Furthermore, no joint breaks were announced but food and drinks were provided throughout the entire time, and if participants felt hungry or thirsty, they simply grabbed a drink or dish. Some of them ate and drank while participating, others sat somewhere to have minute of silence.



Field Note in Relation to Article II: Digital Workplace Transformation

[14/05/2019 Field note: Informal conversation on AutoCo's digital workplace transformation programme]

In the car back from [city], [name redacted] explains that she sees the game changers as tools and actions for managers to change the structure of the organisation and its internal processes or routines. These are provided by the basecamp to managers to make actual changes to the system. Whenever changes are made and the void these changes create are to be filled. This filling process – *learning of new practices* – is guided by the leadership principles. Thus, the game changers illustrate tools and changes that are made by the organisation to *unlearn the known and to learn the new* (the eight principles).

Field Note in Relation to Article III: Traditional Trumps Digital

[17/07/2019 Field note: Informal conversation on the HR coordination of DT initiatives]

During and after the workshop [DT workshop within HR], it was quite clear to participants (and the HR digital unit) that the big moonshots [ideas and initiatives] were already fired and that there was no point in pushing further the implementation of small apps but that it was time to tackle bigger issues. As a result, they [HR digital unit] now seek to focus on internal process optimisation. Yet, within her centre [HR department responsible for supporting a specific business function] she sees few possibilities for this as they don't have large HR processes with significant scaling effects. Plus, she believes that the ideas the management seeks to see or would be willing to sponsor – although no one says it explicitly – are ideas that have the potential to cut headcount. After all, this is HR's major key performance indicator determining its internal success rating.

Field Note in Relation to Article IV: Navigating in the Digital Jungle

[21/03/2018 Field note: Participant observation during a workshop on the internal organisational development unit's DT]

Collecting pain points on their department's DT process, the participants produced the following list:

- Tremendous number of different platforms leading to wild and uncoordinated trial and error:
 - Network drive
 - Microsoft SharePoint
 - OneNote
 - Threema
 - Social Intranet [enterprise social media platform]
 - And more
- No App support for routine tasks such as agenda, protocols etc.
- Digital methods - lack of knowledge regarding digital methods and devices (i.e. hardware) is not as functional as it should be (lack of IT support)

One participant pointed out that “the IT we have, we have to manage alongside. IT develops at a struggling pace, but we ought to take care of that.”

Field Note in Relation to Article V: Cultivating a Digital Jungle

[17/01/2018 Field note: Participant observation in the office assisting a colleague with a software application]

In the office, a colleague asks me whether I could help him with [software]. This occurs at a point of time when official company communication has ruled the use of [software] as breaching IT security policies, and thus, [alternative software] was implemented. Yet, besides this colleague, the [software's] shared team workspace showed several new projects [files] by different colleagues including managers. Thus, the team and its management still use [software] despite the fact that the IT

function informed them that [software] was lacking approval and despite the fact that [alternative software] has been put in place.

[30/08/2019 Field note: Informal conversation with a colleague from a different business function on the same software application]

In regard to [software], [name] asked me about [software]. He said that it's now widely being used also in their meetings etc. Even though he was told that it is not allowed due to cloud security risks.

[14/01/2019 Field note: Participant observation on enterprise social media platform]

Today, I checked the communities, groups and people I follow on [AutoCo's] enterprise social media platform. An interesting post that caught my attention was on [software]. According to this post, IT has now quickened the cloud approval process. Thus, [software] has been approved and globally rolled out: "IMPORTANT: Global IT Shop Go-Live: On the 9th of September [software] was pushed centrally to all IT Shop sites." Checking the digital jungle post and compass, I found that [software] is now listed as an official tool for interactive slideshows.

Appendix 2. Exemplary Code Matrix and Treemap Created with NVivo for Article III

The table below shows a code matrix which I created with NVivo. In order to create this matrix, I first coded the interview transcripts and documents as either related to the human resources or the commercial vehicle site. Second, I coded these interview transcripts and documents. In the coding process, I coded both first-order concepts (i.e. remaining open to the data) and codes related to concepts of article III’s theoretical framing (i.e. institutional logics and coordination of DT initiatives). This second step resulted in the first column. Third, I coded passages in the interview transcripts and documents that dealt with challenges the sites face (or have faced). Lastly, I created a query in NVivo to generate the matrix below, outlining, by site, how often the codes (first column) overlap with the code I placed for challenges. Hence, in the material on the human resources site, the coding resulted in two codes to “Core business alignment” being mentioned as a challenge, while it appears 26 times for the commercial vehicles site. I took this juxtaposition as a representation of my own interpretations of the empirical material. The table below thus afforded me to explore my interpretations of what constitutes a challenge for either of the two sites in coordinating DT. It thus answers questions such as: do my interpretations of challenges refer to the same (or different) codes across the sites? If not (or yes), why could that be and what could it mean? These and similar questions guided my exploration and reflection of my analysis of the collected empirical material.

Codes	Human Resources Challenges	Commercial Vehicles Challenges
Strategy role	11	0
Core business alignment	2	26
Economic situation	4	3
Evangelist	4	0
Fragmentation	16	1
HR business alignment	4	3
Contact point	6	1
Screen	2	0
Source and nurture	6	0
IT landscape	10	0
Management support	7	2
Mindset	21	6
Organisational development triangle	1	0

Table continued.

Codes	Human Resources Challenges	Commercial Vehicles Challenges
External relations	1	0
Internal relations	5	0
Staffing	15	9
Structure	13	10
Ownership	14	0
Interdependencies	2	0
Strategy fit	1	0
Strategy origin	8	0
Decision-making	2	1
Selection criteria	5	1
Skills	6	7
Standardisation	9	0
Implementing	9	0
Re-evaluating	1	0
Beyond core business	0	5
Unfair advantage	0	2

The treemap on the next page shows the dissemination and hierarchy of codes for article III at an advanced analysis stage. The size of a code's rectangle indicates its relative share of all references to this code with a reference being a word, sentence or phrase in the coded material. The inner rectangles (e.g. "Staffing" within "Organising") are subordinate to the outer rectangles, i.e. the boxing indicates the code hierarchy. In the analysis process, I have utilised such diagrams to explore my codes and, thus, the concepts I found in and ascribed to the empirical material on an aggregate level. However, I understand these explorations as investigations of my own analysis, thinking and coding. After all, the treemap (and any other similarly created diagram, spreadsheet or matrix) represents my coding of the material which is subject to my interpretation of that material. Hence, I used them to reflect on my analysis and identify patterns in my coding but refrained from building any arguments on the relative share or the total number of occurrences of a code.

Organising	Structure	Identify		Steering	Select	Mindset		
	Staffing	Digital unit's ...	Contact Point		Implementing	Selection Criteria	Decision Making	
Challenge	Internal Relations	Portfolio Steering		Skills	Fragmentation	IT Landscape	Manage...	
		Strategy Role	Strat...					Stra...
	External Relat...		Economic situation	Standardisation	Lesson L...	Vans...		
	Core Business Alignment							
		Ownership		Beyond Core Busi...	Evangelist	Unfair A...	Vans...	Inst...
				Custom...		Org...		



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