

The Human Side of Digital Transformation – Understanding the Changing Role of Employees and Leaders

Dissertation to obtain the doctoral degree of Economic Sciences (Dr. oec.)

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List of Abbreviations

AI	Artificial Intelligence
AR	Augmented Reality
ATM	Automated Teller Machine
AVE	Average Variance Extracted
CDO	Chief Digital Officer
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CMV	Common Method Variance
COSE	Customer Orientation of Service Employees
COVID-19	Coronavirus SARS-CoV-2 disease, first identified in December 2019
CVF	Competing Values Framework
df	Degrees of Freedom
DTLF	Digital Transformation Leadership Framework
EFA	Exploratory Factor Analysis
FLSE	Frontline Service Employees
FR	Factor Reliability
FST	Frontline Service Technology
GISI	Generation of Ideas for Service Improvement
IoT	Internet of Things
IS research	Information Systems Research
M2M	Machine-to-Machine
MDS	Multidimensional Scaling
ML	Maximum Likelihood
MS Teams	Microsoft Teams
MV	Mean Value
p-value	Probability Value
RMSEA	Root Mean Square Error of Approximation
SD	Standard Deviation
SRMR	Standardized Root Mean Square Residual
VUCA	Volatile, Uncertain, Complex, and Ambiguous Environment
χ^2	Chi-Square

1. Introduction

1.1 Relevance and Scope

“The most successful digital transformations start with a shift in mindset at the employee, leadership, and organization levels.” (Kane, 2019)

In recent years, organizations were prompted to respond to fast-paced disruptions created by digital technologies, particularly in adapting their value creation processes and handling structural changes (Vial, 2019). The way in which organizations adapt to these kinds of digital disruptions is described as *digital transformation* (Kane, 2019). Despite large investments in technology, around 84% of companies undergoing a digital transformation are unsuccessful (Berlin, 2018). However, as a first step in becoming a digital organization, the most successful companies concentrate on the human side of digital transformation (Kane, 2019). Digital transformation has dramatically changed the nature of work for employees as well as leaders (Larson & DeChurch, 2020). Thus, this dissertation focusses on individuals who are considered as key factors for a successful digital transformation (Kane, 2019).

First, digital transformation changes the role of employees (Bowen, 2016). The service industry is especially reshaped through the utilization of *new technologies* (Breidbach & Maglio, 2016; Breidbach et al., 2018; Huang & Rust, 2018) and is therefore considered in a focused manner. In general, it is difficult to predict the impact of new technologies on employees (Breidbach et al., 2018; De Keyser et al., 2019). However, from the service perspective, research shows that technology plays two key functions in changing employees' roles, either in the form of technology as human augmentation or technology as human substitution (Bowen, 2016). One case lies in Pepper, a service robot with physical representation used in retail stores to take and fulfill orders (Keating et al., 2018). Robotic process automation, artificial intelligence (AI), and virtual reality are examples of new technologies that are changing the service production and delivery process (Breidbach et al., 2018). These digital technologies foster innovation but simultaneously threaten human jobs (Huang & Rust, 2018). For example, customer service has turned into self-service through the usage of new technologies (Fluss, 2017; Huang & Rust, 2018).

Since technology increasingly substitutes service employees in practice, the employee's role is progressively changing, and new skills are required (Bowen, 2016). *Skills* are defined as a person's level of competency to perform a task (Peterson et al., 2001). It is important to understand the required skill set to be able to improve skills by training or learning on the job (Peterson et al., 2001).

Second, leaders face overwhelming challenges arising from digital transformation (Larson & DeChurch, 2020; Schallmo et al., 2017). Implementing digital technologies is one challenge for leaders but changing the way employees work is a much greater challenge (Kane, 2019). Leaders play a challenging role during digital transformation as they lead complex organizational transformations, and introduce a new mindset (Kane, 2019). The work environment is changing rapidly, and more and more employees work in self-organized, non-hierarchical teams, using agile methods to develop innovative products and services (Kane et al., 2019). These changes are all associated with digital transformation that increases leadership complexity and requires leadership flexibility (Bolden & O'Regan, 2016). The leader's role is changing in the light of digital transformation; hence, scholars are advised "[...] to totally rethink what constitutes an organization and in turn, its leadership" (Avolio et al., 2014, p. 126).

In addition to the described challenges for employees and leaders, digital transformation was accelerated in 2020 by the COVID-19 pandemic. To reduce the spread of the coronavirus, social distancing was mandatory (Bick et al., 2020). Many organizations required their employees to work from home to avoid physical contact and thereby control the risk of spreading the virus at work (Brynjolfsson et al., 2020). *Remote leadership* is defined as leading in a (geographically) dispersed work environment, where employee interaction is based on digital tools (Bartsch et al., 2020; Huang et al., 2010; Kelley & Kelloway, 2012). Due to the sudden lockdown, organizations and employees had to quickly change their daily routines and adapt to new circumstances, including the intense use of digital tools while working from home (Criscuolo et al., 2020). The new remote work set-up in the context of a global pandemic reveals several challenges in working from home during the global pandemic. Leaders have a particularly decisive function in this pandemic-induced situation (Bartsch et al., 2020), such as in the motivating of employees, the creating of

new collaboration models, and the performing of effective work as a geographically dispersed team.

The context of digital transformation and the global health pandemic can be described as a volatile, uncertain, complex, and ambiguous environment, also referred to as VUCA world (Bennett & Lemoine, 2014). Figure 1 provides an overview of the different challenges that arise for employees and leaders who operate in a so-called VUCA environment.

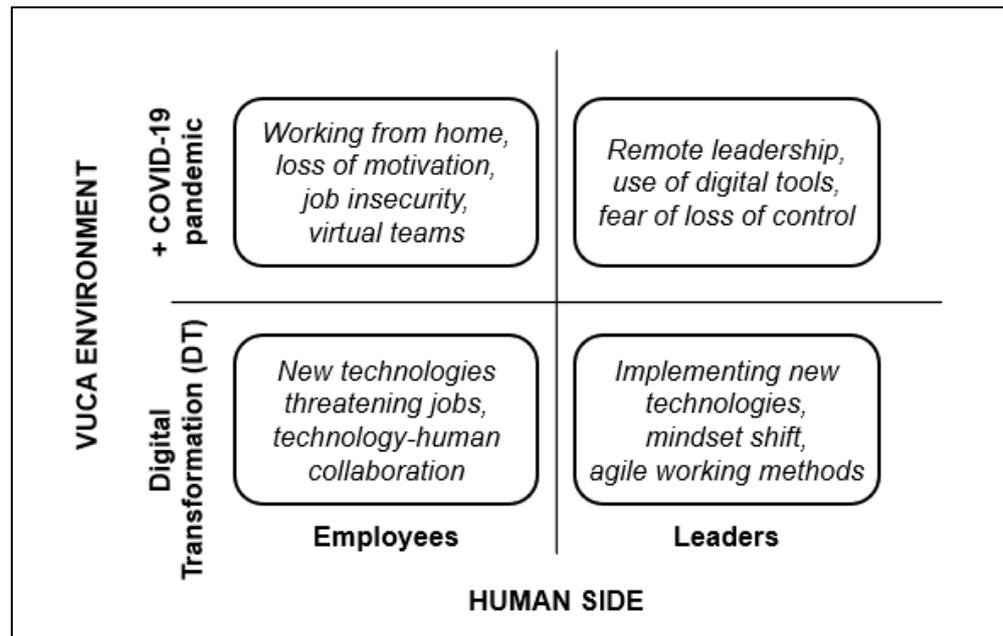


Figure 1: Challenges for employees and leaders in the context of digital transformation and the COVID-19 pandemic (illustrative).

Existing research approaches are stretched to their limits in view of these developments regarding the changing roles of employees and leaders in the context of digital transformation, and additionally in the face of a global pandemic. To date, little research exists on what role-specific skills are needed for service employees in a technology-based service encounter (Larivière et al., 2017). Nevertheless, it is important for organizations and employees to know, which human skills are necessary to achieve a high-quality service outcome in combination with new technologies (Wilson & Daugherty, 2018). Previous research focuses on technology roles, conceptual archetypes (De Keyser et al., 2019) of customer contact in relation to technology (Froehle & Roth, 2004), and the changing roles of employees in service theory and practice (Bowen, 2016). Larivière et al. (2017) outline the importance of creativity and empathy as areas where employees still outperform technology. However, to

date, much remains unknown about the specific skills underlying each distinct employee role in a technology-based service encounter (Larivière et al., 2017). Knowledge regarding specific skills is crucial to develop effective trainings for service employees to be able to deal with technology as a 'partner' (Larivière et al., 2017).

Moreover, research in the area of leadership is very limited in light of digital transformation, although such disruptive developments have significant consequences on leadership (Uhl-Bien & Arena, 2018). To date, appropriate leadership behaviors for dealing with leadership challenges particularly in relation to digital transformation have not been comprehensively addressed in a quantitative empirical study. Some leadership researchers focused on a changing environment, such as transformational leadership (Bass, 1999), e-leadership (Avolio et al., 2014; Avolio et al., 2000), paradoxical leader behaviors (Zhang et al., 2015), ambidextrous leadership (Rosing et al., 2011), virtual leadership (Malhotra et al., 2007), and paradoxical virtual leadership (Purvanova & Kenda, 2018). In the context of digital transformation, leaders face challenges, such as adapting to and successfully implementing emerging technologies (Van Wart et al., 2017) or handling employee insecurities and fear of job loss due to automatization (Cascio & Montealegre, 2016). Dealing with this kind of tension creates a huge responsibility on leaders who try to make their companies more competitive in the light of digital transformation (Schoemaker et al., 2018). However, appropriate leadership behaviors in digital transformation are not sufficiently addressed in these existing leadership approaches. Consequently, a leadership approach that specifically focuses on digital transformation is needed. The Competing Values Framework (Quinn, 1988; Quinn & Rohrbaugh, 1981) outlines the trade-offs, paradoxes, and contradictions among organizations and their leaders (Belasen & Frank, 2008). However, it must be reexamined in the context of digital transformation because digital transformation amplifies these conflicts.

Research on leadership in the context of digital transformation is not yet established, likewise there is very limited research available concerning leading from home during a pandemic crisis. The effective usage of digital tools while abruptly leading from home during a global pandemic is particularly underexplored. The COVID-19 pandemic suddenly required social distancing rules, which resulted in working remotely wherever possible (Bick et al., 2020;

Brynjolfsson et al., 2020). Due to the sudden lockdown situation, people were forced to change their daily routines at a rapid pace. Hence, employees quickly adapted to new circumstances and the intensive use of digital tools (Criscuolo et al., 2020). Working from home makes leadership quite complex (e.g., due to missing interactions between employees and leaders) and thereby requires specific leadership practices supported by the use of a variety of digital tools. Further research is required in exploring daily leadership behaviors and their effectiveness (Kelemen et al., 2020; Knippenberg et al., 2005).

In sum, this thesis addresses the demonstrated research gaps by answering the following research questions:

- (1) How do digital transformation and new technologies transform service employee and leadership roles? (*Paper 1 and 2*)
- (2) What specific skills are required for service employees in technology-based service encounters? (*Paper 1*)
- (3) What are appropriate leadership behaviors in the context of digital transformation? (*Paper 2*)
- (4) Which leadership practices do leaders perform from home during the COVID-19 pandemic? (*Paper 3*)
- (5) How can leaders be effective working remotely with the aid of digital tools during the COVID-19 pandemic? (*Paper 3*)

This thesis seeks to fill in the demonstrated gaps and address the research questions with three distinct but related papers. All three papers focus on the human side of digital transformation. Paper 1 concentrates on service employees' roles and skills by developing a skill-based framework for employees in technology-based service encounters. Paper 2 focuses on the development of the Digital Transformation Leadership Framework (DTLF) to generate insight into leadership roles in technology-driven business environments. Paper 3 explores daily experiences of leaders aiming to work effectively while using digital tools and remotely performing leadership practices during the COVID-19 pandemic. Paper 1 is a conceptual paper, Paper 2 is based on a mixed method approach, and Paper 3 is conducted as an explorative, qualitative study. Figure 2 gives an overview about the three research papers involved in this thesis.

The Human Side of Digital Transformation – Understanding the Changing Role of Employees and Leaders

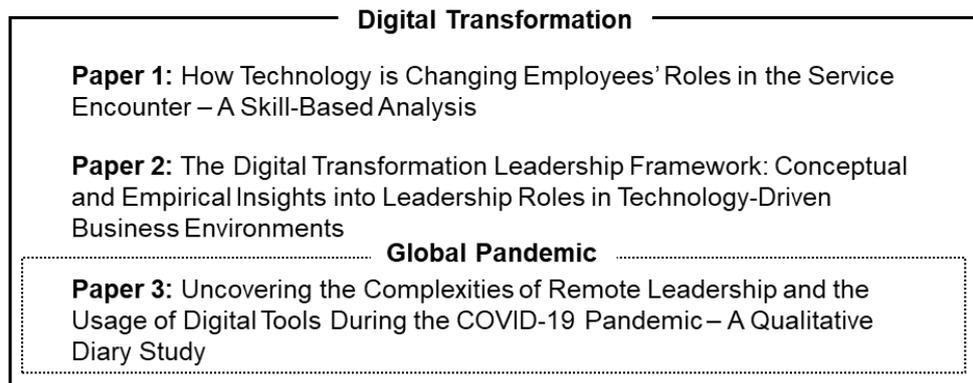


Figure 2: Paper overview.

1.2 Contributions to Research

In answering the research questions, this thesis contributes to research on the human side of digital transformation in four important ways.

First, existing research on digital transformation mainly focuses on the benefits of new technologies (Alavi & Habel, 2021). Studies outline that organizations often rush into the implementation of new technologies and thereby forget about the importance of employees and leaders who are responsible for its success (Kane, 2019). Hence, this research contributes to existing literature by extending the understanding on the human side of digital transformation (accelerated by a global pandemic). This research focuses on the changing roles, skills and practices of employees and leaders in the context of a (crisis-induced) digital transformation, thereby building the foundation for further research on the human side of digital transformation.

Second, this thesis supplements existing service literature by contributing to the understanding of how technology is changing employees' roles in the service encounter. In particular, this thesis explores which specific skills service employees need to possess in the technology-based service encounter. In this way, this thesis presents a classification scheme of eight different service encounter archetypes focused on human-augmented service encounters, such as technology-assisted customer encounters (De Keyser et al., 2019; Froehle & Roth, 2004). Additionally, this thesis introduces four transformed frontline service employee roles in light of the evolving service context

(e.g., the role of an innovator) (Bowen, 2016; Larivière et al., 2017). Finally, a skill-based framework for frontline service employees was developed. While previous research either considered evolving service encounter archetypes (e.g., De Keyser et al., 2019; Froehle & Roth, 2004) or looked at transformed service employee roles (e.g., Bowen, 2016; Larivière et al., 2017), this thesis connects both research approaches by synthesizing the archetypes and employee roles and, consequently, developing a frontline service employee skill-based framework, investigating archetype- and role-specific frontline service employee skills. Well-founded knowledge concerning new service employee skills is highly relevant for organizations and employees, as the technical infusion of service encounters requires a human-technology collaboration resulting in the need for new employee skills.

Third, this thesis contributes to leadership literature by aiming to provide a better understanding of leadership challenges arising from digital transformation. It also extends leadership literature by providing insight into digital leadership roles appropriate to the leadership challenges associated with digital transformation. Moreover, this thesis provides a measurement scale for the identified leadership roles. Researchers may apply this measurement scale in pertinent future research about leadership in the context of digital transformation. Moreover, this thesis supplements existing literature on the Competing Values Framework (CVF) by transferring and adapting the framework to the context of digital transformation. In this way, the original leadership roles and dimensions (Quinn, 1988) are validated and modified. The study findings reveal that new leadership roles occur in the digital era (e.g., digital pioneer, digital mentee). Some original CVF roles (e.g., innovator, mentor) are still important, but other roles have become less relevant (e.g., manager). Finally, some original CVF roles must be adjusted slightly to better address the challenges of digital transformation. Findings show that the flexibility-stability dimension in the context of the changing environment can be interpreted as task-relation dimension (Vilkinas & Cartan, 2001). In sum, our study findings contribute to a research field of high academic and economic interest and encourage researchers to apply the identified roles and deepen the research on leadership in the context of digital transformation.

Fourth, this thesis extends upon existing virtual and crisis leadership literature, identifying performance management and team development as key

virtual leadership functions (Bell & Kozlowski, 2002). This study's findings confirm the relevance of task- and relation-oriented leadership during a crisis (Bartsch et al., 2020), whereas relation-oriented leadership practices are focused. Moreover, this thesis adds to previous research concerning the increased complexity of leading virtual teams due to the lack of face-to-face communication (e.g., Purvanova & Bono, 2009). These findings are supplemented by demonstrating the suitability of video conferences to make up for face-to-face communication when leading from home. In addition, this thesis contributes to research on effective leadership in a challenging and unpredictable situation. The study findings reveal several drivers and barriers with positive and negative impacts on leadership effectiveness when coping with crisis-specific challenges. For example, previous research declares a set of guidelines for virtual meetings as a critical success factor (White, 2014). This study supplements these previous findings in identifying meeting guidelines and frequent personal interactions as drivers for effective leadership. However, the limited support of digital tools for creative and collaborative tasks, as well as missing opportunities for socializing are recognized as barriers to effective remote leadership. Since working from home is here to stay, this explorative research might encourage further research on remote and hybrid leadership and digital tools.

1.3 Structure of this Thesis

Following an introduction, this thesis is divided into three main chapters with a concluding overarching discussion.

Chapter 1 clarifies the relevance and scope of this thesis, addresses research gaps, defines the main research questions, outlines the contributions of this study, and finally presents the structure of this thesis.

The core purpose of Chapter 2 of this thesis is to examine employee roles and skills in technology-based service encounters. First, it begins by classifying the different roles of technology in the service encounter based on the archetypes of De Keyser et al. (2019). Second, it presents the transformed key roles of employees identified by Bowen (2016) and Larivière et al. (2017). Finally, this paper develops a skill-based framework for service employees.

Chapter 3 includes the conceptualization of a Digital Transformation Leadership Framework (DTLF) comprised of seven distinct leadership roles that are appropriate for organizations to face leadership challenges arising from digital transformation: the digital pioneer, the innovator, the networker, the manager, the enabler, the mentor, and the digital mentee. Furthermore, a scale measuring the seven digital leadership roles is developed. Additionally, the CVF is transferred and adapted to the context of digital transformation. Comparing the CVF roles with the DTLF roles allows drawing conclusions concerning the appropriateness of the CVF in the light of digital transformation.

Chapter 4 of this thesis explores the daily experience of leaders aiming to lead effectively while using digital tools and working remotely during the COVID-19 pandemic. The purpose of the study is to gain a better understanding on the complexities of remote leadership in the context of a global pandemic. The chapter starts with a comprehensive literature review on crisis leadership, virtual leadership, leadership and technology, and virtual leadership and the COVID-19 pandemic. Next, research questions and contributions are presented, followed by the empirical portion describing the method of diary studies and the findings. The chapter finishes off with guidance and practical advice on how to improve remote leadership effectiveness and concludes with a research outlook.

This thesis concludes in Chapter 5 with an overarching discussion. This chapter offers theoretical and managerial implications, provides suggestions for future research, outlines limitations, and finally provides a concluding statement. Figure 3 illustrates the structure of this thesis.



Figure 3: Structure of this thesis (schematic).

Chapter 2

How Technology is Changing Employees' Roles in the Service Encounter – A Skill-Based Analysis

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2. How Technology is Changing Employees' Roles in the Service Encounter – A Skill-Based Analysis¹

2.1 Introduction

The use of new technologies, such as robotic process automation, artificial intelligence (AI), or virtual reality, is increasingly reshaping the service industry by changing the service production and delivery process, representing a substantial source of innovation but, at the same time, threatening human jobs (Breidbach & Maglio, 2016; Breidbach et al., 2018; Huang & Rust, 2018). Many parts of service interactions have already been automated through the usage of new technologies, thus turning customer service into self-service (Fluss, 2017; Huang & Rust, 2018). For example, service robots with a physical representation such as Pepper, which is used in retail stores to take and fulfill orders, or virtual representation, such as Alexa, which can be used for voice-based banking (Keating et al., 2018; Wirtz et al., 2018).

It is difficult to predict the impact of these new technologies (Breidbach et al., 2018; De Keyser et al., 2019). However, the employee's role is changing in an evolving service context, where technology is increasingly substituting for service employees in practice (Bowen, 2016). It is important to note that employees still play an essential role in service interactions. Organizations gain the highest performance improvements when humans and machines work together, compared to technology-free or full technology service encounters (Wilson & Daugherty, 2018). Employees remain important actors in service interactions, since humans can empower virtual robots in multiple ways, for example, by teaching them what they need to do, or explaining the outcomes to other human actors to enhance transparency (Wilson & Daugherty, 2018). However, to date, there is little research on what specific skills are needed for service employees to execute their role in the technology-based service encounter (Larivière et al., 2017). Nevertheless, employees should know which human skills are required in combination with new technologies to

¹ This paper is published as: Krehl, Eva-Helen (2020): How Technology is Changing Employees' Roles in the Service Encounter – A Skill-based Analysis. In: Bruhn, M., Hadwich, K. (Eds.): *Automatisierung und Personalisierung von Dienstleistungen*. Forum Dienstleistungsmanagement, Springer Gabler, Wiesbaden, p. 228-249. https://doi.org/10.1007/978-3-658-30166-8_9

achieve high service outcomes (Wilson & Daugherty, 2018). Therefore, an essential question arises: Which specific skills do service employees need in the technology-based service encounter? The answer to this question is also crucial from an organizational point of view to be able to hire and train employees accordingly (Larivière et al., 2017).

Thus, following the call for further research on what specific skills underlie the service employee role in the service encounter (Larivière et al., 2017), the core purpose of this paper is to examine employee roles and concordant skills in technology-based service encounters. As a first step, this paper aims to show how technology is impacting service employees and, hence, begins by classifying the different roles of technology in the service encounter based on the archetypes of De Keyser et al. (2019). Further, the second purpose of this paper is to present the key roles of employees in the technology-based service encounter identified by Bowen (2016) and Larivière et al. (2017). After determining the key roles of technology and service employees, the paper addresses its third and core purpose which is to compile a skill-based framework for service employees and deduce role-specific skills by combining the aforementioned approaches (see Figure 4).

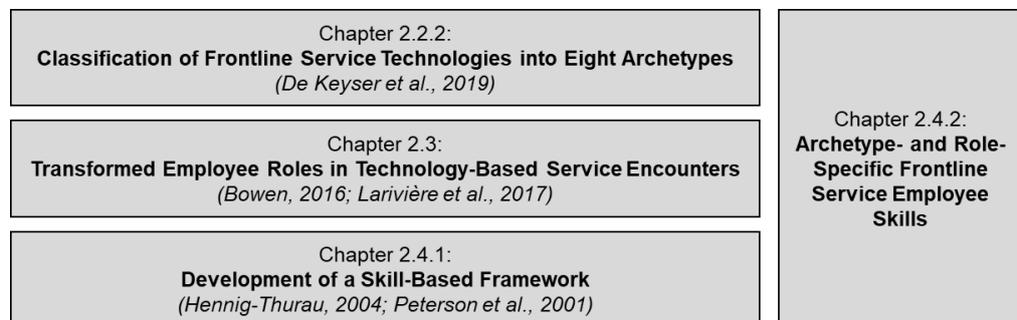


Figure 4: Overview of core chapter structure of this paper (author's illustration).

The contribution of this paper is threefold. First, it provides an overview of a classification of frontline service technologies in eight different archetypes (De Keyser et al., 2019). Second, it contributes by providing insights into the current academic discussion about how technology is changing employees' roles in service interactions (Bowen, 2016; Larivière et al., 2017). Third, this paper makes an important contribution by synthesizing the archetypes and employee roles and, consequently, developing a frontline service employee (FLSE) skill-based framework (Peterson et al., 2001; Hennig-Thurau, 2004).

Finally, this paper discusses potential managerial implications and future research directions and thereby contributes to the current service literature.

2.2 Use of Technology in Service Encounters

2.2.1 Definition of Frontline Service Technologies

In the recent past, the service encounter was described as “personal interactions between customers and employees” (Bitner et al., 1990), a “game between persons” (Bowen, 2016) or a “high-touch, low-tech” encounter (Giebelhausen et al., 2014). Today, however, the service encounter is changing rapidly due to the frontline service technology (FST) infusion, which is now omnipresent (De Keyser et al., 2019). According to Van Doorn et al. (2017), “technology infusion” is defined as “the incorporation by service organizations of technological elements into the customer’s frontline experience” (p. 43). Thereby, organizations aim to reduce costs and manage service employees and, at the same time, offer better and more personalized services (Rust & Huang, 2014). Examples of FSTs range from ATMs to humanoid advanced robots or Internet of Things (IoT) applications (Mende et al., 2019).

2.2.2 Classification of Frontline Service Technologies

This chapter provides a classification scheme of the different FST infusion archetypes based on previous research by De Keyser et al. (2019), enriched by the insights of Froehle and Roth (2004), Larivière et al. (2017), and Marinova et al. (2017). De Keyser et al. (2019) use a conceptual approach to update and extend existing classifications of FST. The set of different FST archetypes helps us to understand how technology is changing the service encounter. De Keyser et al. (2019) claim that, in practice, customer journeys typically consist of a combination of several archetypes. The classification scheme roughly categorizes technology-based services into four criteria: technology-free, technology-augmented, technology-substituted, and full technology service encounters (De Keyser et al., 2019). The technology-augmented service encounters comprise technology-assisted, technology-facilitated, and technology-mediated service encounters (see Figure 5).

A) Technology-free FLSE and customer service encounter

The technology-free service encounter, in which technology does not take part, is not further considered in this analysis, since this paper concentrates on technology-infused service encounters (De Keyser et al., 2019).

B) Technology-assisted FLSE (and customer) encounter

Froehle and Roth (2004) describe this archetype as “technology-assisted customer contact,” which underlines the fact that technology is used as assistance to improve the customer contact. In general, technology supports human thinking and behavior in the service encounter (Keating et al., 2018; Larivière et al., 2017; Marinova et al., 2017). A closer look at the employee role and tasks in this archetype reveals that FLSEs use technology to provide a better service encounter outcome and thereby differentiate their services from similar standardized service offerings (Larivière et al., 2017). Due to the direct interaction between customers and FLSEs, employees gain the chance to develop a deep understanding of their customers and improve the customer relationship by delivering great service (Huang & Rust, 2017; Wirtz et al., 2018).

One common example is airline or hotel check-ins when FLSEs get assistance from a service terminal to check in their customers. In this situation, customers do not have access to the technology (Froehle & Roth, 2004). Another emerging example is augmented reality (AR) catering menus, where service employees are able to present the food directly on the table in front of their customers (Keating et al., 2018). As a third example, smart glasses are smart technologies that augment service employees' capacity (Huang & Rust, 2017). Using smart glasses, FLSEs can receive real-time customer-specific information to support individual cross-selling offerings (Huang & Rust, 2017; Larivière et al., 2017).

To conclude, it may be stated that, in the technology-assisted FLSE (and customer) encounter archetype, service employees can make use of the high human touch to differentiate themselves from competitors, which is needed since differentiation is important in more standardized services (e.g., airline check-in) with a low amount of tech. Moreover, the customer interaction with and direct physical presence of the FLSEs are valuable means to understanding the customers and being able to generate innovative ideas for an even better customer experience (De Keyser et al., 2019).

C) Technology-assisted customer (and FLSE) encounter

In turn, the technology-assisted customer (and FLSE) encounter archetype represents service encounters in which the customer – and not the FLSE – is augmented by technology (De Keyser et al., 2019). Since more and more customers are non-stop online with one or more mobile devices and other wearables, this archetype becomes increasingly relevant (De Keyser et al., 2019). Research about in-store mobile phone use shows the customers' distraction through the parallel use of mobile devices (e.g., comparing prices) and the decreasing impact on point-of-purchase sales (Grewal et al., 2018). Losing sales to the internet can negatively impact FLSEs who may feel threatened in their role as salespersons (Rapp et al., 2015). Applications are emerging on the market, such as Google Lens, which supports customers in obtaining real-time relevant product information by scanning (De Keyser et al., 2019). This could help FLSEs to spend the majority of their time on providing complex information to customers and referring to the app for other less important details.

Employee tasks in this archetype are mainly the customer interaction, whereby a company could make a difference, such as providing an innovative application for their customers to support the sales experience. Human interaction remains important in this archetype, since, to this point, "human capital remains a non-substitutable source of innovation and creativity" (Bowen, 2016).

D) Technology-facilitated FLSE and customer encounter

Froehle and Roth (2004) call this archetype "technology-facilitated customer contact". Here FLSEs, as well as the customers, do have access to the technology. The interaction can be described as technology that creates a connection between an FLSE and a customer (Larivière et al., 2017). FLSEs enable their customers to commonly use the technology in the service encounter. Due to the use of technology, service employees are able to handle complex service situations that could never be managed manually (Bitner et al., 2000).

One example is online counselling or education that is done mostly online (Keating et al., 2018). Another example is IKEA's kitchen co-design approach, which is applied in direct physical presence of the customer and FLSE (De Keyser et al., 2019). An emerging example is the Microsoft HoloLens,

which allows users to see different Lowe's kitchen layouts in real-time while receiving assistance from an FLSE (De Keyser et al., 2019).

E) Technology-mediated FLSE and customer encounter

The technology-mediated encounter archetype (Froehle & Roth, 2004) is characterized by connecting geographically separated actors (De Keyser et al., 2019). Technology enables the interaction between customers and FLSEs who are physically co-located (Froehle & Roth, 2004). Through the use of technology, the perceived distance is reduced and other benefits, such as time efficiency, convenience, or cost reduction, gain in value (De Keyser et al., 2019). Employees' tasks in this archetype focus on technological skills, which make them feel confident when using the technology. Typical examples of this archetype are service encounters via phone, e-mail, or live chat (De Keyser et al., 2019). A more recent use is the case of transatlantic surgery, for example, when US surgeons control a surgical robot working in a European hospital (Schumann et al., 2012).

F) Technology-substituted FLSE encounter

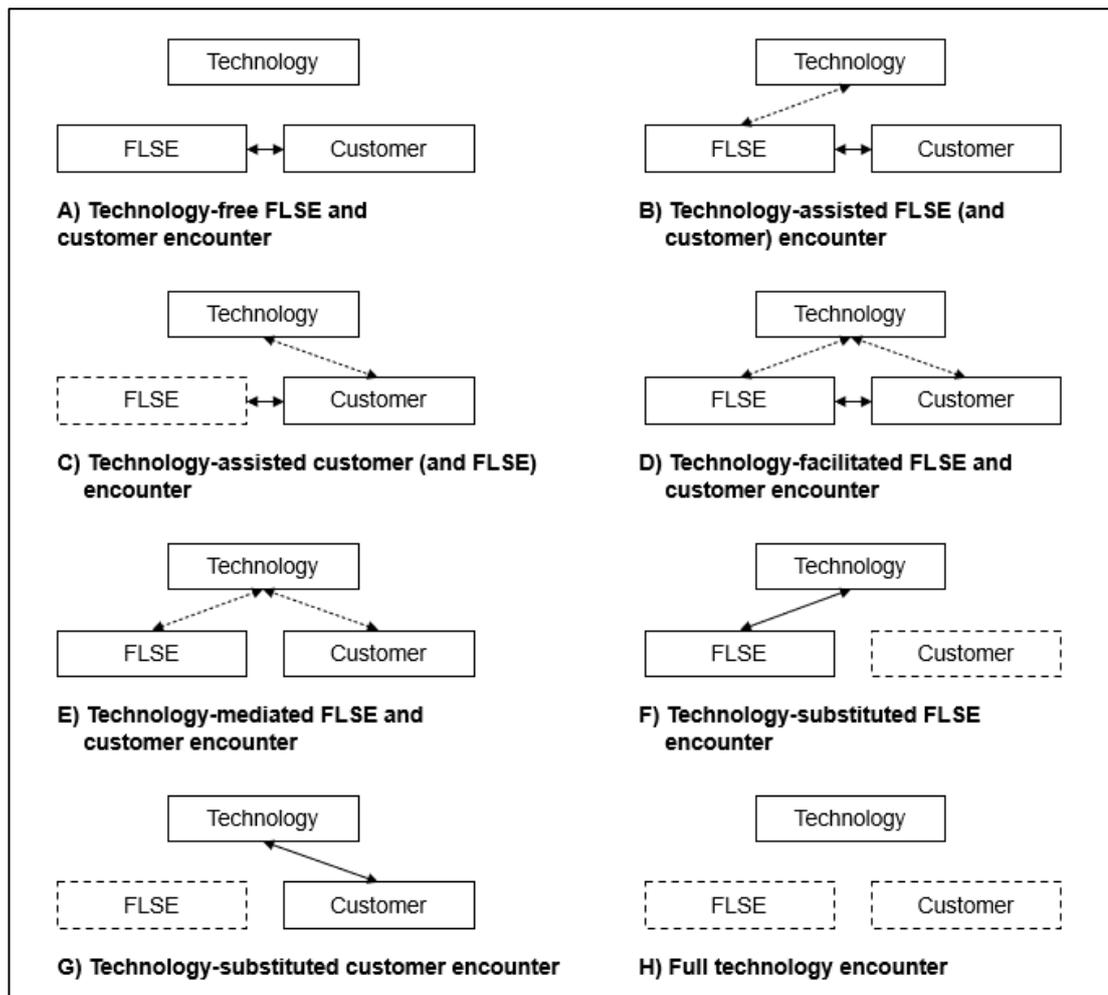
This archetype involves service encounters where technology substitutes for customers, for example, through IoT applications. Technologies either make decisions autonomously on behalf of their customers (e.g., "sense" customers' locations) or use pre-defined customer preferences (e.g., characteristics or behaviors which trigger actions) (De Keyser et al., 2019; Verhoef et al., 2017). In this case, FLSEs communicate with technologies instead of customers (De Keyser et al., 2019), and thereby high technical skills are required. The interaction happens mainly remotely, meaning the service provider is able to access the service object while being co-located (Schumann et al., 2012). Examples can be found in the fields of IT, such as remote control of IT systems, or in engineering, such as remote repair or maintenance (De Keyser et al., 2019). Another example is Google Duplex, the technology makes calls on behalf of their users to schedule appointments (De Keyser et al., 2019). The advantage of this archetype is to provide the highest convenience to their customers by undertaking actions on their behalf and not being restricted to a location (Berry et al., 2002; Schumann et al., 2012; De Keyser et al., 2019).

G) Technology-substituted customer encounter

In the archetype of the technology-substituted customer encounter, employees are completely replaced by technology. There is no interaction between the FLSE and the customer needed (Bitner et al., 2000; Keating et al., 2018). The use of technologies in this archetype is typically represented in the example of self-service technologies, such as ATMs, online banking, online retailing, or automated car washes (Froehle & Roth, 2004; Scherer et al., 2015; De Keyser et al., 2019). The substituted tasks are highly commoditized, very simple to perform, and repetitive (Huang & Rust, 2017). Driverless cars are another upcoming example where highly commoditized transactional services involve no humans (Huang & Rust, 2017). The value of this archetype can be summarized as its higher flexibility (Meuter et al., 2000) and convenience for the customer (Berry et al., 2002; Ding et al., 2007), as well as increased customer satisfaction resulting from a high participation level (Dong et al., 2015).

H) Full technology encounter

Finally, the full technology encounter entails situations where no active involvement of either FLSEs or customers is needed (De Keyser et al., 2019). According to Van Doorn et al. (2017), machine-to-machine (M2M) transactions will gain importance due to current IoT developments. M2M is described as fully automated service encounters with minimal human intervention (Van Doorn et al., 2017). One example of this emerging archetype is toll programs, where transponders inside cars interact with sensors in toll lanes when driving through the toll station. The system works by using a connected prepaid toll account and no action – from an FLSE or customer – during the journey is required (De Keyser et al., 2019). This archetype provides a high service convenience and fast service delivery for customers, as well as cost savings for the service provider (Berry et al., 2002).



Notes: FLSE = frontline service employees; FST = frontline service technology; direct interaction; direct interaction augmented by technology; substituted by technology.

Figure 5: Overview of FST archetypes (De Keyser et al., 2019, p. 159; Froehle & Roth, 2004, p. 3).

Taken together, FST plays two key roles in the service encounter: one is technology as human augmentation (archetypes B – F), and the other is technology as human substitution (archetypes G and H). Archetype F is a borderline case, since FLSEs are augmented and customers are substituted by technology. However, this paper concentrates on the role of FTEs, therefore archetype F is included in the further analysis of human-augmented service encounters. The focus of the next chapter is on the transformed employee roles in the service encounter, where FLSEs are not substituted.

2.3 Transformed Employee Roles in Technology-Based Service Encounters

The role of service employees has changed dramatically over the last decades (Bowen, 2016). In earlier works, the dyadic interactions between service employees and customers were the focus (Solomon et al., 1985). Currently, the context in which service encounters take place has evolved from dyadic interactions to technology-enabled complex service networks (Tax et al., 2013). Further, the analysis of service outcomes has shifted from service quality and service satisfaction to overall customer experience (Bowen, 2016; Maklan & Klaus, 2011; Verhoef et al., 2017).

However, little research has examined which roles service employees fill in a more complex and technology-enabled service context. Some notable exceptions include Bowen (2016) and Larivière et al.'s (2017) studies, presenting four transformed employee roles: the innovator, differentiator, enabler, and coordinator. Bowen (2016) introduces these roles in the light of an evolving service context, whereas Larivière et al. (2017) draw on these elaborations and also indicate that the traditional service employee role, delivering the service, persists in various services today. Nevertheless, it is relevant to understand how employee roles are already changing to prepare for the future of the human workforce (Larivière et al., 2017). It is also important to mention that service employees could perform one or more of the four roles at the same time, meaning that these roles do not exclude each other (Bowen, 2016; Larivière et al., 2017).

The role of innovator

One transformed role of service employees is the role as innovator (Larivière et al., 2017). The innovator role is an important one since "human capital remains a non-substitutional source of innovation and creativity" (Bowen, 2016). This might seem to be no new finding, but especially in combination with technology, service employees can create innovative ideas, which are scalable and customized (Brynjolfsson & McAfee, 2012).

Ordanini and Parasuraman (2011) find that collaborating with contact employees in the service innovation process enhances both innovation volume and innovation radicalness. Innovation volume was operationalized as the

number of service innovations implemented for one year, and innovation radicalness was defined as the extent to which a firm's new service is radically distinguished from current offerings (Ordanini & Parasuraman, 2011). They explain that the strong effect is based on the frequent and close interactions with the customers and, therefore, being able to identify room for improvement (Ordanini & Parasuraman, 2011).

Lages and Piercy (2012) investigate, in their study about service innovation, the drivers of employee generation of ideas for service improvement (GISI). Their research shows that employee reading of customer needs is the major driver of the GISI (Lages & Piercy, 2012). These results lead to the managerial implication of carefully selecting and recruiting service employees, especially paying attention to their ability to read customer needs (Lages & Piercy, 2012).

The role of differentiator

In the role as differentiators, the service employees are making the difference for customers, and not the technology which can – in most cases – be replicated easily (Larivière et al., 2017; Wirtz & Jerger, 2016). Often, small details make a big difference, especially when competitors only differentiate by price (Bolton et al., 2014). But, only by adding the right degree of human touch to the service encounter will service employees be able to differentiate from competitors (Bowen, 2016). Service employees must be behaviorally equipped to handle a wide variety of difficult situations; therefore, the most relevant skills are mainly interpersonal skills and social skills (Wirtz & Jerger, 2016).

The fit between an organization's brand and employees is described as employee brand identification, and it impacts the service quality (Hurrell & Scholarios, 2014). Research by Hurrell and Scholarios (2014) shows evidence that "the people make the brand" in services. Their findings support the proposition "that employee brand identification will be strong in organizations that report few social skill gaps" and vice versa (Hurrell & Scholarios, 2014). The authors define the various needed social skills, such as service orientation or social perception skills (Peterson et al., 2001). Thus, employees' brand identity and social skills could be some of the small details which make the difference for customers in the service encounter.

The role of enabler

Another service employee role in the transformed service context is the enabler role (Bowen, 2016). Due to technology infusion in the service encounter, FLSEs augmented or substituted by technology. However, using new technologies could lead to a negative or frustrating customer experience, for example, when problems occur due to difficulties in the process. By performing the enabler role, employees have the chance to re-verse this negative experience into a positive and satisfying experience (Larivière et al., 2017) by empowering their customers to successfully use new technology. FLSEs enable customers, as well as technology, to perform in the service encounter and thereby support an improved service outcome (Bowen, 2016). The focus lies on how the employee can add to the technology-customer exchange, and not on how technology can add to the employee-customer exchange (Bowen, 2016).

Research by Parasuraman (2000) concerning the “technology readiness” of service employees and customers shows that employees must assist customers with a low technology readiness index to enable them using technology-based systems (Bowen, 2016). Wunderlich et al. (2013) reveal how service employees can contribute to the customers’ acceptance of technology-based, smart interactive services, for example, by increasing social presence.

The role of coordinator

The final transformed service employee role proposed by Bowen (2016) and Larivière et al. (2017) is the coordinator role. Traditionally the “service encounter” is a dyadic concept including the service provider and the customer (Tax et al., 2013). But, in times of technology infusion, from a customer’s perspective, not only one service provider takes part in the customer’s journey. Leading and subordinate service providers act together in a service delivery network (Tax et al., 2013). In this service delivery network, customers act as “resource integrators” to pursue a specific objective (Lusch & Vargo, 2006). In the context of complex service systems and networks, such as those based on technical platforms, the service employee role of the coordinator becomes increasingly relevant (Ostrom et al., 2015). The several interactions among multiple parties require active coordination by service employees (Larivière et al., 2017). Besides handling coordinative tasks, service employees act as a

harmonizing party among the network partners to manage the interdependencies (Tax et al., 2013). A good customer experience gains value through consistency and connectivity of touchpoints, which assure seamless transitions (Homburg et al., 2017). According to Bowen (2016), additional research is required to specify the skills that employees (and customers) need to perform the coordinator role. Indeed, resource management is an important skill to integrate and manage resources from one's own organization and other network partners (Bowen, 2016). For example, in engineering service ecosystems in the automotive industry, interdependencies among several actors, such as the provider of engineering services, the vehicle manufacturer, the test bench specialist and different suppliers, need to be coordinated (Becker, 2019).

To sum up, these four roles clearly emphasize the contribution of service employees in technology-based service encounters and answer the question how technology changes FLSEs' roles (Larivière et al., 2017). FLSEs assume these roles in "varying degrees depending on the context" (Bowen, 2016).

2.4 Employee Skills in Technology-Based Service Encounters

2.4.1 Development of a Skill-Based Framework

After having delineated the roles, technology can have in the service encounter and how employee roles are transformed due to technological impact, this chapter will now focus on the essential component of employee skills. The following section concentrates on the specific skills employees will need in the context of new technologies in the service encounter. Skills can be defined as a person's level of competency to perform a task and can be improved by training or gaining experience in specific tasks (Peterson et al., 2001).

To provide a more detailed overview about the specific skills across all employee roles and human-augmented archetypes, a skill-based framework was developed based on existing construct definitions. The skills taxonomy by Peterson et al. (2001) and the skill dimensions of the customer orientation of service employees (COSE) (Hennig-Thurau, 2004) were used as a basis for the conceptualization of the FLSE skill-based framework. The skills taxonomy by Peterson et al. (2001) concentrates on environmental change, since it was

originally developed to answer the question of what skills should be developed in the workforce due to technological changes. The taxonomy is separated into two dimensions: basic skills (content and process skills) and cross-functional skills (problem-solving, social, technical, systems, and resource management skills) (Peterson et al., 2001). Additionally, the four-dimensional conceptualization of the COSE skills was especially created for service employees, since customer orientation was identified as the major element of a service (Hennig-Thurau, 2004). The four COSE dimensions are social skills, technical skills, motivation, and authority (Hennig-Thurau, 2004). By synthesizing both elaborations, service employee skills with a focus on customer orientation in a changing context are covered.

As a result of merging the skills taxonomy (Peterson et al., 2001) and the COSE dimensions (Hennig-Thurau, 2004), a skill-based framework was developed, concentrating on FLSE skills in the technology-infused service encounter. The FLSE skill framework consists of six dimensions: social skills, technical skills, problem-solving skills, resource management skills, decision-making authority, and motivation. Each of the six dimensions can be broken down to several subdimensions (see Table 1).

Skill-Based Framework for Frontline Service Employees
<i>BASIC SKILLS</i>
<p><i>Social skills</i> (Hennig-Thurau, 2004; Peterson et al., 2001):</p> <ul style="list-style-type: none"> – having extensive social skills/high social perceptiveness – being able to consider customers' perspectives – knowing how to treat a customer well/high service orientation
<p><i>Technical skills</i> (Hennig-Thurau, 2004):</p> <ul style="list-style-type: none"> – having a high level of knowledge – being experts in their job – being highly competent
<i>CROSS-FUNCTIONAL SKILLS</i>
<p><i>Problem-solving skills</i> (Peterson et al., 2001):</p> <ul style="list-style-type: none"> – being able to identify problems – being able to generate innovative ideas – showing a high solution orientation
<p><i>Resource management skills</i> (Peterson et al., 2001):</p> <ul style="list-style-type: none"> – having a high level of time management skills – knowing how to manage material resources – knowing how to manage personnel resources
<i>ESSENTIALS TO TRANSFER FLSE SKILLS INTO BEHAVIORS</i>
<p><i>Decision-making authority</i> (Hennig-Thurau, 2004):</p> <ul style="list-style-type: none"> – being able to decide autonomously in customer matters – having appropriate room to maneuver in solving customer problems – not needing to ask a supervisor for permission

- Motivation* (Hennig-Thurau, 2004):
- showing strong commitment to do the job
 - doing the best to fulfill their customer needs
 - being always highly motivated

Table 1: Frontline service employee skill framework (adapted from Hennig-Thurau, 2004, p. 477 and Peterson et al., 2001, p. 465).

The six dimensions are divided into three types: basic skills, cross-functional skills and essentials to transfer FLSE skills into behaviors (Hennig-Thurau, 2004). In this paper, I propose social and technical skills as basic skills in the technology-based service encounter. Social skills mainly cover interpersonal skills and the ability to interact and understand customers. Technical skills involve a high tech-affinity and expert knowledge about new technologies.

Additionally, I propose cross-functional skills, which summarize problem-solving and resource management skills. Problem-solving skills involve problem identification and solutions, as well as innovation and creativity. Resource management skills comprise management of time, people, and material resources. Both skill types are considered as cross-functional, since problem-solving, as well as resource management, involves comprehensive thinking and interaction.

Finally, I propose to cover essentials to transfer FLSE skills into behaviors, such as decision-making authority and motivational skills. Autonomously making decisions and thereby being able to immediately take action, such as solving customer problems, describes the first dimension. Being intrinsically highly motivated and being able to motivate others are the skills in the final dimension of the skill framework. Being motivated can be defined as being “moved to do something,” for example, when FLSEs are responsible to introduce new technologies or other service innovations to their customers and thereby need to be intrinsically motivated as well as being able to motivate their customers (Cadwallader et al., 2010).

In summary, it can be said that all six dimensions are relevant for FLSEs to perform their roles in the technology-based service encounter. While some skills might be more role-specific than others, a comprehensive analysis will be conducted in the next chapter.

2.4.2 Archetype- and Role-Specific Frontline Service Employee Skills

This chapter provides a synthesis of the following: 1) human-augmented service encounter archetypes, 2) FLSE transformed roles, and 3) FLSE skills. Through allocation of archetypes, roles, and skills, an overview was developed, creating a number of propositions and supporting the literature, along with practical applications.

Services can be provided by humans and/or machines (Huang & Rust, 2018). The skill-based framework focusses solely on augmented services (archetypes B–F), where employees still play an active role in the service encounter. Employee roles and tasks differ depending on the FST archetypes. In order to detect the role-specific FLSE skills in technology-based service encounters, each of the four identified transformed employee roles is further examined. Thus, it is important to understand that the employee roles are not mutually exclusive, meaning an employee might perform more than one role if required by the context (Larivière et al., 2017). Further investigation into the five human-augmented technology archetypes outlines which transformed employee roles and corresponding skills might be more likely performed in which technological archetype. These roles will be called “focus roles” in the following. Also, focus roles are not mutually exclusive, meaning several roles can be performed in one archetype.

According to the basic skills, it can be recognized that social skills are more important in archetypes B–D, where a direct interaction between the FLSE and the customer exists. Technical skills are highly relevant in archetypes where a direct interaction (or one augmented by technology) between FLSE and technology exists, as in archetypes B, D, E, and F.

- *Archetype B: technology-assisted FLSE (and customer) encounter (e.g., airline check-in)*

The example of technology-assisted airline check-in shows that the technology – assisting the FLSE – is not the main factor which brings differentiation in this archetype (Bowen, 2016). However, the FLSE her/himself more likely performs the differentiator role by developing a customer experience with authentic human touches (Bolton et al., 2014). Customers in the technology-infused service encounter often seem to be very internet-savvy; however, many cases (e.g., failure handling) show that many of

them prefer the human touch in the (after-)sales interaction (De Keyser et al., 2015; Larivière et al., 2017). Besides a focus on social skills, flexibility is also a relevant differentiator skill, which is required to meet individual customer needs (Bolton et al., 2014).

- *Archetype C: technology-assisted customer (and FLSE) encounter (e.g., in-store mobile phone use)*

When customers are always online, using their mobile devices in-store to get assistance while comparing prices and offerings, it seems that the importance of FLSEs decreases (Rapp et al., 2015; De Keyser et al., 2019). But FLSEs can use the direct customer contact and transfer the information they receive firsthand about their customers into innovative ideas, such as while they observe customer behaviors and reactions (Larivière et al., 2017). In this archetype, FLSEs might increasingly perform the innovator role by generating innovative technology-based ideas during the customer interaction to create new solutions improving the service outcome (Brynjolfsson & McAfee, 2012). Service innovation primarily evolves in the service encounter interaction between FLSEs and customers, for example, by developing ad hoc solutions for customers in the case of unplanned problems (Siahtiri, 2018). Another example is the development of new applications where customers can scan the products and get real-time information, thereby allowing the FLSEs to strengthen their roles in focusing on the more complex questions (De Keyser et al., 2019). Specific FLSE skills could be described as distinct problem-solving skills combined with the ability to read customer needs (Bowen, 2016).

- *Archetype D: technology-facilitated FLSE and customer encounter (e.g., IKEA's kitchen co-design approach)*

The example of the IKEA kitchens' co-design approach shows that employees might perform the role of the enabler in this archetype (De Keyser et al., 2019). In the service encounter, both parties – FLSEs and customers – use the technology together, thereby the employee supports and enables the customers by using the technology (Bowen, 2016). Enabler skills are mainly technical skills, since FLSEs need to feel confident in using the new technology to be able to enable their customers (Bowen, 2016). These distinct technical skills are complemented by inter-personal skills,

which we put on a level with social skills (Bowen, 2016). As an example, FLSEs in the “back office” enable technology and thereby function as “front-line” employees in technology-infused service encounters (Bowen, 2016).

- *Archetype E: technology-mediated FLSE and customer encounter (e.g., transatlantic surgery with surgical robots)*

As represented in the transatlantic surgery example, FLSEs play a coordinating role in this archetype (De Keyser et al., 2019). In the role as coordinator, FLSEs manage several involved interdependencies, such as customers (patient) and technology (surgical robot), as well as themselves (Bowen, 2016). To gain efficiency, mainly resource management skills are required to harmonize interdependencies among network partners (Tax et al., 2013).

- *Archetype F: technology-substituted FLSE encounter (e.g., remote control of IT systems)*

Similar to archetype D, where the FLSE acts as an enabler for the customers, the FLSE acts as an enabler for the technology. As the example of remote control of IT systems shows, there is no longer any interaction between the FLSE and customer (De Keyser et al., 2019). This means that the FLSE mainly interacts with the technology, and high technical skills are therefore required (De Keyser et al., 2019).

The following table (Table 2) provides an overview of the five human-augmented archetypes, including the discussed examples. According to Keating et al. (2018), the archetypes are classified depending on their respective touch and tech degrees. The focus FLSE roles and principal FLSE skills are listed in the columns on the right-hand side. These roles and skills are highlighted as focus roles and principal skills since the assumption is that these are mainly performed and required, but still complemented by additional roles and skills depending on the context.

Archetype + Example	Touch/tech degree	Focus FLSE role	Principal skill(s)
<i>B) Airline check-in</i>	High touch/low tech	Differentiator	Social skills
<i>C) In-store apps</i>	High touch/low tech	Innovator	Problem-solving skills
<i>D) IKEA kitchen co-design</i>	High touch/high tech	Enabler (FLSE enables customer)	Social skills + technical skills
<i>E) Surgical robot</i>	Low touch/high tech	Coordinator	Resource management skills
<i>F) Remote control of IT systems</i>	Low touch/high tech	Enabler (FLSE enables technology)	Technical skills

Table 2: Human-augmented service encounter archetypes, examples, and corresponding focus service employee roles and skills (author's illustration, adapted from Bowen, 2016; De Keyser et al., 2019; Keating et al., 2018; Larivière et al., 2017).

There are skill types which are assumed to be of higher importance for specific FLSE roles, such as social skills for the differentiator, problem-solving skills for the innovator, social and technical skills for the enabler, or resource management skills for the coordinator. In general, it can be stated that FLSEs need to have a deep understanding of their customers and (technical) service processes to deliver an appropriate service outcome (Wirtz et al., 2018). Therefore, each of the six identified skill types will be required depending on the situation. However, research in this area shows that the top priority of FLSE skills will be the "softer" intuitive and empathic social skills, since AI is taking over more and more of the analytical tasks (Huang & Rust, 2018). Research on the future of technology-based service encounters with a timeline up to 2050 predicts a change from service encounters dominated by robots and virtual assistants to technology-assisted service encounters, where technology is supporting the interpersonal and or virtual interaction between FLSEs and customers (Keating et al., 2018). This scenario again highlights the need for the social skills of service employees, whereas analytical skills could be covered by technology (Huang & Rust, 2018). To achieve the desired service outcomes, training for FLSEs is needed. For example, FLSEs need to learn routines in the service processes, memorize important information, and feel confident using technology in the service encounter (Wirtz et al., 2018).

2.5 Discussion

Technologies are rapidly changing the service encounter of organizations and, at the same time, service employee' roles. The primary purpose of this paper was to answer how these new technologies are changing frontline service employee roles. This paper has contributed to our understanding of how technology is changing employees' roles in the service encounter by first presenting a classification scheme of eight different service encounter archetypes, thus showing how the focus lies more precisely on human-augmented service encounters. Additionally, the paper highlights four transformed frontline service employee roles, as well as the corresponding skill types. In particular, a skill-based framework for frontline service employees was developed.

Considering the different service encounter archetypes, it is important to understand that the technical infusion of the service encounter does not always mean substitution of service employees. Instead, new technologies augment service employee roles and require new skills depending on the context. Emerging archetypes can range from human-augmented, via human-substituted to full technology service encounters. Employee roles differ depending on the technological impact in the service encounter. Transformed roles as innovator, differentiator, coordinator, or enabler require specific employee skills. The main skill types are social, technical, problem-solving, and resource management skills, as well as high motivation and autonomous decision authority.

The insights presented in this paper also provide some contributions for practitioners. For example, organizations that consider the implementation of a new technology and the usage of the classification scheme to weigh the pros and cons of the different technological archetypes in terms of augmentation or substitution of employees can thus be better informed. Thus, they could include existing employee skills in their considerations based on the developed skill-based framework. Also, an organization's management team could think about the presented transformed employee tasks and skills and plan how to hire and train service employees for the required roles. In practice, it seems that organizations have yet to solve how to hire and train service employees for these roles (Bowen, 2016). Finally, it could be important for managers to carefully determine the need for training and support on an individual level,

since implementing a specific archetype or transitioning from one archetype to another has different impacts on various employees (De Keyser et al., 2019).

In terms of training or employee development, an interesting approach, which could be considered, is the “T-Shaped” approach (Bowen, 2016). FLSEs with T-shaped skills profit from specific skills in which they are experts in “specific” skills (vertical axis), such as coding skills, and, at the same time, several “broad” skills across different contexts and functions (horizontal axis), such as problem-solving skills (Barile et al., 2015). The cross-functional skills are required to innovate in a fast-changing environment (Barile et al., 2015). Moreover, T-shaped employees bring the flexibility to switch between the principal vertical skills and overarching horizontal skills as required from their environment (Demirkan & Sphorer, 2015). In the light of digital transformation, the T-shaped approach helps FLSEs to stay flexible and adapt situationally.

Notwithstanding the above contributions, the paper has some limitations, which lead to future research ideas. First, it is especially important to empirically explore the transformed service employee roles. Therefore, it can be suggested, as one way to extend the work, to conduct an exploratory study, for example, by collecting qualitative interview data as a first step (Breibach & Maglio, 2016). Moreover, other researchers are encouraged to conduct further research on the impact of new technologies in the service encounter, especially to gain further insights into employee roles in the technology-based service encounter. Therefore, various questions need to be explored in further research, for example: How can companies support their FLSEs to gain a high service outcome in a changing environment (besides training)? and How can a high fit between FLSEs skills and service employee role be assured?

In sum, this paper has illuminated in particular, the employee-specific opportunities of technology-infused service encounters and thereby aims to contribute to further research in this area.

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Chapter 3

The Digital Transformation Leadership Framework: Conceptual and Empirical Insights into Leadership Roles in Technology-Driven Business Environments

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3. The Digital Transformation Leadership Framework: Conceptual and Empirical Insights into Leadership Roles in Technology-Driven Business Environments²

3.1 Introduction

Organizations and their leaders are facing overwhelming challenges that arise from digital transformation (Hanelt et al., 2020; Schallmo et al., 2017), which is a disruptive change process caused by new digital technologies that influence all aspects of life (Verhoef et al., 2021; Vial, 2019). Digital transformation has dramatically changed the nature of work. Nowadays, many employees work in at least partly virtual, self-organized, non-hierarchical teams, using agile methods and digital technologies to generate innovative products and services (Kane et al., 2019). These powerful and unsettling changes associated with digital transformation increase leadership complexity, while also requiring considerable flexibility (Bolden & O'Regan, 2016). For example, on the one hand, leaders must know when and how to adopt and successfully implement emerging technologies (Van Wart et al., 2017). On the other hand, they have to consider an insecure workforce that fears digital transformation due to automatization, which could rapidly change or even replace their jobs (Cascio & Montealegre, 2016). Hence, leaders have a huge responsibility to handle these tensions in organizations and to remain competitive in the digital age (Schoemaker et al., 2018).

One approach which captures tensions, trade-offs, and paradoxes within organizations and their leaders is the competing values framework (CVF). Despite the considerable agreement about the overall value of the CVF, research suggests that the underlying assumptions of the approach need to be retested (Belasen & Frank, 2008). Hence, researchers are questioning the relevance of the established leadership roles and altering their positions within the CVF (e.g., Vilkinas & Cartan, 2006). Belasen and Frank (2008) reveal that

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the factor structure of the roles depends mainly on the context in which they are embedded and evaluated. Thus, the question arises whether the existing leadership roles of the CVF are still appropriate in times of digital transformation.

Answering this question is difficult considering that research on leadership in digital transformation is still very limited (Cortellazzo et al., 2019; Uhl-Bien & Arena, 2018). Thus far, research lacks knowledge on which leadership behaviors are appropriate for dealing with the leadership challenges associated with digital transformation. Therefore, Avolio et al. (2014, p. 126) advise scholars “[...] to totally rethink what constitutes an organization and in turn, its leadership.” Thus, one core purpose of the current study is to identify leadership roles that appropriately address the leadership challenges digital transformation brings. Following this, our second purpose is to collate the identified roles with the existing leadership roles of the CVF and thereby evaluate their appropriateness in times of digital transformation. Consequently, an empirical comparison requires developing a scale to measure the identified leadership roles.

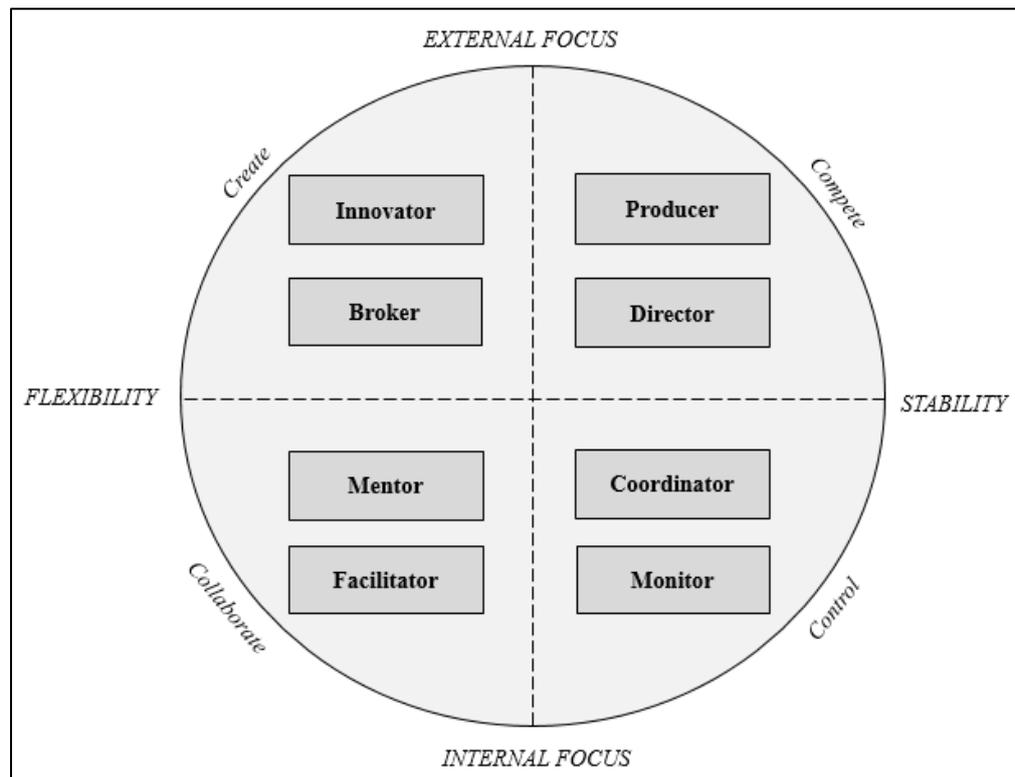
We contribute to the leadership literature in several ways. First, we extend the leadership literature by identifying leadership roles appropriate to the leadership challenges associated with digital transformation. Second, we develop and introduce a measurement scale for the identified leadership roles. To examine the validity of the new scale, we use a multiple-study approach. Third, we complement the CVF literature by transferring and adapting the framework to the context of digital transformation. By empirically comparing the CVF with leadership roles appropriate to the leadership challenges of digital transformation, we draw conclusions about the appropriateness of the CVF in such dynamic, technology-driven business environments. Thereby, we investigate the number and placement of the leadership roles as well as possible configurations of the quadrants in the context of digital transformation.

3.2 Competing Values Framework

The CVF (Quinn, 1988; Quinn & Rohrbaugh, 1981) highlights the trade-offs, paradoxes, and contradictions within organizations and their leaders (Belasen & Frank, 2008). This well-established framework (Cameron et al.,

2006) overcomes viewing leadership behaviors in an either/or fashion by emphasizing that leadership effectiveness requires the integration of competing leadership roles (Buckner & Williams, 1995; Lawrence et al., 2009). The framework has been used to explain a variety of organizational phenomena, for example, in the fields of leadership, human resource management, or organizational culture (Vilkinas & Cartan, 2006). By focusing on individual leadership behavior, the CVF provides a taxonomy of managerial roles differentiated by situational contingencies (Belasen & Frank, 2008). The CVF defines two dimensions that express the competing values leaders face in complex organizational environments: a flexible versus stable structure and an internal versus external focus (Kalliath et al., 1999). Initially, Quinn (1988) identified eight leadership roles (facilitator, mentor, innovator, broker, monitor, coordinator, producer, and director). These roles are embedded in four quadrants, named Collaborate, Create, Control, and Compete (see Figure 6). The capacity to exhibit such a broad array of behavior is called behavioral complexity and is related to greater managerial and leadership effectiveness (Denison et al., 1995; Vilkinas et al., 2020). Consequently, leaders should not only think complexly but also behave complexly by engaging in different, even opposing leadership strategies (O'Neill & Quinn, 1993).

Although researchers highlight the overall value of the CVF, they call to retest the factor structure of the CVF roles, as it depends mainly on the context in which they are embedded and evaluated (Belasen & Frank, 2008), resulting in modifications of the CVF and its leadership roles (e.g., Hooijberg & Choi, 2000; Vilkinas & Cartan, 2006). In the context of digital transformation, skills like innovating, creating conditions that facilitate an organization's digital maturity, and networking become more important to manage disruptive businesses (Kane et al., 2019; Lavine, 2014; Sousa & Rocha, 2019). Hence, we assume that some leadership roles of the original CVF insufficiently meet the leadership challenges accompanied by digital transformation. In this context, certain leadership roles might become less relevant, while others may become more important (e.g., the innovator); some existing roles might be complemented with new behaviors, and entirely new roles may be added. Against this background, we seek to identify leadership roles that are appropriate in digital transformation and collate them with the original CVF roles.



Note. A 45-degree rotation was applied.

Figure 6: The Competing Values Framework according to Quinn (1988).

3.3 Developing a Digital Transformation Leadership Framework

Study 1: Qualitative Study for Identifying Appropriate Leadership Roles

We first took a qualitative approach to systematically study which specific leadership behaviors are appropriate to manage the challenges associated with the digital era. We conducted 30 in-depth interviews with digital transformation experts who provide a comprehensive understanding of the phenomenon from their experience of developing digital strategies or as members of organizational teams that engage in digital transformation initiatives. We ensured a diverse sample in terms of industries, company sizes, numbers of employees, and age of participants. The interviewee included 4 females and 26 males, of whom most were between 31 and 40 years old (33.3%) (see Appendix 1). Data saturation was reached at approximately 30 interviews, after which no new information appeared in the data (Guest et al., 2006). We asked the same set of self-developed open-ended questions to all 30 participants to ensure that the themes that arose were not just random occurrences (Heyler et

al., 2016) and to enable comparison between respondents' answers (Williamson & Johanson, 2018). At the beginning of every one-on-one interview, we gave a short illustrative summary of circumstances changing due to digital transformation to ensure a consistent understanding of the context. Next, we asked the experts to share their thoughts on leadership behavior they considered specifically relevant in times of digital transformation. The third part of the interview introduced deeper, follow-up questions. The interview sessions lasted approximately 30 minutes each. We reviewed the data with a thematic analysis, an iterative approach for identifying, analyzing, and reporting themes and categories within the data in rich detail (Braun & Clarke, 2006). Specifically, we followed the thematic analysis steps suggested by Braun and Clarke (2006). To ensure the trustworthiness of our findings, we applied both researcher and data triangulation (Bluhm et al., 2011). All reliability thresholds have been met (see Appendix 2). The coding scheme and "proof quotes" to demonstrate a clear chain of evidence from data to interpretations (Pratt, 2008) can be found in Appendix 3.

The qualitative study disclosed multiple leadership behaviors, which we clustered based on shared content-related similarities (Nowell et al., 2017). Throughout the process, we developed abstract categories that represent distinct leadership roles. Based on the responses, we identified six different leadership roles, each characterized by specific leadership behaviors: the digital pioneer, the innovator, the enabler, the mentor, the networker, and the manager.

A *digital pioneer* is a leader who understands the drivers of digital transformation and identifies both business opportunities and risks arising from digital transformation. In this context, such leaders are able to detect early digital trends that will impact their department. Hence, they continually question the status quo of digital transformation to identify where change might be necessary. Further, they conceptualize a clear digital vision and strategy.

Second, the *innovator* is a leader who drives and implements change processes based on her/his innovative and creative ideas. These leaders show enthusiasm and inspire their employees by inventing the new. They take innovative initiatives and engage in creative problem-solving approaches to increase innovation.

A third role that emerged from the data is the *enabler*. These leaders create agile, flexible, and empowering work settings for their team members. Besides, such leaders produce working environments that encourage team members to try out new ideas and enable a culture of learning by supporting trial and error. Further, they enable working in collaborative, non-hierarchical, interdisciplinary, and intercultural teams, seeing themselves as active team members and fostering participative decision making.

Fourth is the *mentor* role. As a mentor, the leader acts as a relationship manager who strives to establish strong and trusting relationships with employees, while providing individual support, mentoring, and feedback to encourage and motivate them to achieve their individual goals. Leaders who excel in the mentor role put effort into identifying and understanding the individual strengths and weaknesses of their employees.

Fifth, a leader as a *networker* develops, scans, and maintains interdisciplinary networks within and outside the organization. Such leaders aim to create an information network that enables consultation of many different sources to solve emerging issues. This allows the networker to collect and share necessary information quickly.

Finally, a leader as a *manager* “does things right.” The manager is strongly oriented to task and goal achievement. In this context, the manager attends closely to relevant key performance indicators. Further, leaders in this role effectively structure, coordinate, and control work and outcomes according to business criteria with a primary objective of getting the work done efficiently.

In sum, the qualitative study results show that all leadership roles involve appropriate leadership behaviors in the light of digital transformation. Hence, we name them the *digital transformation leadership roles* and propose that they can be embedded in an overarching framework, the *digital transformation leadership framework*.

3.4 Conceptualizing the Digital Transformation Leadership Framework

Inter-relationships between the roles

Following Behrendt et al.'s (2017) approach to disclose how constructs relate to one another, we first explicate how the digital transformation leadership roles interact. The digital pioneer and the innovator have in common that they focus on digital transformation and share the primary objective of staying abreast of change. However, the digital pioneer is strategically oriented, while the innovator concentrates on the operative level. For instance, the digital pioneer develops a digital and imaginative vision, whereas the innovator is willing to commit resources to achieve this vision by applying creative and innovative working methods. Comparing the enabler and mentor roles reveals that they both comprise relation-oriented leadership behaviors. However, these roles differ in their perspective in that an enabler focuses on the whole team by creating agile and empowering work settings, whereas the mentor concentrates on each individual employee by providing individual support and feedback. The roles of the networker and the manager show the least overlap with the other leadership roles. Networkers are focused on their relationship-building activities inside and outside the organization, whereas managers are characterized by their internal focus on managing organizational tasks. Both roles can be interpreted as relatively traditional although they remain relevant in the digital transformation context.

Relationships with the CVF roles

To ensure construct clarity when introducing and conceptualizing new or modified constructs, researchers are requested to examine similarities and differences between newly introduced construct(s) and other constructs that already exist in the field (Banks et al., 2018; Le et al., 2010). Hence, we conceptually compare the digital transformation leadership roles with the CVF and its roles. The manager role overlaps with the four CVF roles monitor, producer, director, and coordinator. This is broadly in line with Vilkinas and Cartan (2001), who also formed the producer, director, and coordinator to one role, named the deliverer, which is characterized by its goal achievement orientation. Additionally, Denison et al. (1995) found a strong overlap between these three CVF roles. Furthermore, the enabler, mentor, networker, and innovator roles build on the CVF roles facilitator, mentor, broker, and innovator; concluding that these roles remain important in the digital age. However, some new leadership behaviors emerged and have been added to these retaining roles

to stress digital transformation in more detail (e.g., facilitating a redesigned workplace by enabling flexible and agile work structures as well as creating an open error culture). Moreover, the digital pioneer role is an entirely new component, which is not described or articulated in the original CVF. Hence, similarities and differences can be observed between the original CVF roles and the digital transformation leadership roles, with some roles increasing in importance, some decreasing, and others are entirely new (see Appendix 4).

Assumptions of the digital transformation leadership framework and its roles

The emerging leadership challenges in digital transformation call for new and complementary leadership behaviors (Kane et al., 2019). However, the results of the qualitative study revealed that some leadership roles and role-concordant behaviors are already present in existing leadership approaches, such as the CVF. We conclude that it is therefore necessary to combine existing leadership behaviors with new leadership behaviors to successfully confront the leadership challenges arising from digital transformation. Consequently, the digital transformation leadership framework should not be interpreted as an entirely new leadership approach. Instead, the digital transformation leadership framework is a full-range leadership approach with some overlap regarding existing leadership concepts. Furthermore, we assume that a leader might not exhibit all digital transformation leadership roles simultaneously. In the real world, it is more likely that a leader will exhibit the digital transformation leadership roles in varying degrees, depending on the particular leadership situation. This is in line with studies on the CVF revealing, for example, that leaders display the mentor and producer roles significantly more than any of the remaining CVF roles (Vilkinas & Cartan, 2001).

3.5 Scale Development Process

Empirically comparing the original CVF with the digital transformation leadership framework and its roles requires developing a scale that measures the identified leadership roles. Therefore, we conducted an extensive scale development process based on Crawford and Kelder's (2019) scale development recommendations for leadership constructs. The scale development process includes three phases: item development, test of content validity, and empirical evaluation (see Table 3).

Study 2: Item Development

To develop rigorous items and item descriptions, we grounded them in the literature (MacKenzie et al., 2011), conducted face validity checks (DeVellis, 2016), and separated the research team by including external experts who performed a “classification from above” (Hinkin, 1995). We generated the digital transformation leadership items based on (1) our conceptualization, (2) relevant literature concerning various leadership measurements (e.g., questionnaire items of the CVF developed by Denison et al., 1995), and (3) the results of 30 in-depth interviews with digital transformation experts. Importantly, we generated items for each of the six digital transformation leadership roles separately. Also, each construct is modeled as having reflective indicators. We developed an initial set of 42 items. These items represent the six identified digital transformation leadership roles, with the following dimension-level distribution: digital pioneer, 7 items; innovator, 6 items; networker, 5 items; enabler, 9 items; mentor, 9 items; and manager, 6 items.

Study 3: Test of Content Validity

To assess the content validity of our initial item set (Hinkin, 1995), we conducted a classifying study (Liden & Maslyn, 1998), which is aligned with Schriesheim et al.'s (1993) Q-factor analysis technique. The underlying objective was to check for preliminary validity and item coverage before conducting a full-scale empirical test (Crawford & Kelder, 2019). This deductive classifying study was an iterative two-round survey process in which independent experts assessed the items to avoid researcher bias (Crawford & Kelder, 2019). We asked the participants to place each randomly ordered item into one of the six digital transformation leadership roles. Additionally, a free text field allowed them to add further digital transformation leadership roles to ensure we captured all relevant digital transformation leadership roles. Hence, the experts could recommend that we drop, change, or add items and clarify ones they marked as unclear (Liden & Maslyn, 1998). This study involved 42 external experts, recruited from the researchers' networks. Of the external experts, 33.3% were female, with an average age of 37.5 years ($SD = 10.16$).

Based on this expert feedback, we created a seventh leadership role. In doing so, we followed Yaniv's (2011) recommendation to view a definitional system of constructs as an open system that allows additional facets to be

added at any time. We named the seventh leadership role the *digital mentee*. A leader in the digital mentee role is characterized by seeking advice from her/his employees on digital issues and refines her/his digital skills through the employee's input. Moreover, the digital mentee actively exchanges information with her/his employees in order to benefit from their digital know-how. In this vein, such leaders learn from their employees how to use digital tools that they do not know yet. We additionally developed six items pertaining to the digital mentee based on the participants' statements and relevant literature (e.g., Anderson et al., 2017).

We determined the interrater reliability for both iterative rounds using percentage of agreement, Perreault and Leigh's (1989) I_r , and Fleiss' (1971) kappa. Overall, the interrater reliability measures showed acceptable rater agreement values (see Table 3). Based on this, we included to the initial item set only those items that achieved a minimum of 80% accuracy in the digital transformation experts' classification (Hinkin, 1995). In addition, we refined eleven items that had achieved the threshold, but of which experts recommended changes that would capture each digital transformation leadership role more accurately. The final item instrument consists of 39 items measuring leaders' self-perceptions of their own leadership behaviors using Likert scales ranging from 1 = *strongly disagree* to 7 = *strongly agree*. Each of the seven digital transformation leadership roles is operationalized based on five or six items (see Appendix 5). Additionally, employees may rate the leadership behaviors of their leaders. Therefore, we also rephrased the items to allow employees to provide perceptions of their leaders.

Study 4: Empirical Evaluation

To assess the reliability and validity of the survey items, we conducted an empirical evaluation process (see Table 3), including scale evaluation and test of predictive validity (Ford et al., 2019; Wright et al., 2017). We collected data from two independent samples of German employees. Appendix 6 shows the characteristics of the two samples, denoted as Sample A and Sample B. The employees rated the digital transformation leadership behaviors of their direct leaders on the 39 items of the digital transformation leadership scale.

First, we performed an EFA of the theoretically derived digital transformation leadership framework using Sample A; the rotated factor structure revealed seven distinguished factors that explained a significant amount of the variance (67.70%). All items loaded highly on the anticipated dimension, while showing negligible cross-loadings. Next, we performed a CFA using maximum likelihood (ML) estimation. The CFA results gave a satisfactory fit [$\chi^2 = 1122.941$; $df = 664$; $p < .000$; RMSEA = .051; SRMR = .058; CFI = .945]. All 39 items showed significant standardized factor loadings (range .63 to .92, $p < .01$) on their respective constructs. Hence, the CFA model fit and loading magnitude support the adequacy of the proposed factor structure (DeSimone et al., 2017). All factor reliability (FR) values, the Cronbach's alpha values, and the average variance extracted (AVE) scores exceeded the recommended thresholds (Bagozzi & Yi, 1988). Also, all seven constructs met Fornell and Larcker's (1981) criterion for discriminant validity. Hence, the results provide evidence of internal-consistency reliability and of construct and discriminant validity.

Second, to determine the impact the seven digital transformation leadership roles have in view of digital transformation as a disruptive change process, we have chosen outcome variables that are considered relevant in the context of organizational transformation (i.e., innovative job performance, knowledge sharing, and digital maturity), using Sample A and B. Employees' innovative job performance can be understood as the intentional generation, promotion, and realization of new ideas that facilitate innovative change (Janssen & Van Yperen, 2004). Knowledge sharing refers to the practice of an employee sharing ideas, information, and suggestions with team members (Srivastava et al., 2006). Wang et al. (2017) reveal that an employee who actively shares knowledge with team members facilitates innovation and performance. Digital maturity designates the degree to which an organization has transformed its digital processes, digital talent engagement, and digital business models (Kane et al., 2015). An organization's digital maturity depends largely on a clear digital strategy supported by leaders who foster a change culture (Kane et al., 2015) and enhance employees' abilities to facilitate innovation due to their vision and scheme (Damanpour & Schneider, 2006; Sarros et al., 2008). We assume that the identified digital transformation leadership

roles increase innovative job performance and knowledge sharing among employees, as well as enhance an organization's digital maturity.

Employees' innovative job performance was measured with nine items of Janssen's (2001) scale for individual innovation in the workplace, which includes items like "I create new ideas for difficult issues." The Cronbach's alpha was .94. We used Bartol et al.'s (2009) eight item-scale to measure employees' knowledge sharing ($\alpha = .89$; sample item: "I actively seek helpful information to share with the group"). We assessed digital maturity with a single item developed by Kane et al. (2015) that involved asking the employees "to imagine an ideal organization transformed by digital technologies and capabilities that improve processes, engage talent across the organization, and drive new value-generating business models." They then rated their organization against this ideal on a scale from 1 to 10. We controlled for gender and age of the participants, and additionally for the participant's progressiveness in relation to the digital world and the average frequency with which s/he dealt with digital transformation because we suspected they were related to either the independent or the dependent variables.

The results (see Appendix 7) show that employees who perceived their leaders as enablers ($\beta = .13, p < .1$) and innovators ($\beta = .19, p < .05$) indicated higher levels of innovative job performance. Employees who perceived their leaders as networkers ($\beta = .17, p < .05$), enablers ($\beta = .18, p < .05$), and digital mentees ($\beta = .20, p < .01$) reported higher levels of knowledge sharing. Leaders who were perceived as innovators ($\beta = -.34, p < .01$) had a negative impact on employees' knowledge sharing. Further, organizations' digital maturity was significantly affected by leaders who were perceived as digital pioneers ($\beta = .35, p < .01$) and managers ($\beta = .15, p < .05$).

Summarizing, the results provide evidence for the scale's construct, discriminant, and criterion validity (see Table 3).

Empirical Studies	Sample and Method	Results
Study 1: Identification of Appropriate Leadership Roles	Qualitative study based on 30 in-depth interviews with digital transformation experts	<ul style="list-style-type: none"> ▪ 6 categories of different leadership roles and behaviors
Study 2: Item Generation	Item generation study based on the results of the qualitative study and literature of related leadership	<ul style="list-style-type: none"> ▪ Achieving face validity ▪ 6 digital transformation leadership roles ▪ Initial item set: 42 items

	approaches (e.g., questionnaire items of the CVF developed by Denison et al., 1995).	
Study 3: Test of Content Validity	<p>Classifying study (Hinkin, 1995)</p> <ul style="list-style-type: none"> ▪ Sample size: n = 42 digital transformation experts of several industries ▪ Iterative multi-round survey process in which participants place each randomly ordered item into one of the digital transformation leadership roles 	<ul style="list-style-type: none"> ▪ Achieving content validity and trustworthiness of the findings [Percentage of agreement: Round 1: .80, Round 2: .77; Perreault and Leigh's I: Round 1: .87, Round 2: .85; Fleiss' kappa: Round 1: .63, Round 2: .58] ▪ 7 digital transformation leadership roles
Study 4: Empirical Evaluation	<p>Study to test the construct and discriminant validity</p> <ul style="list-style-type: none"> ▪ Sample size: n = 263 employees ▪ Explorative factor analysis (EFA) ▪ Cronbach's alpha ▪ Confirmatory factor analysis (CFA) ▪ Test of alternative models 	<ul style="list-style-type: none"> ▪ EFA: 7 factors (explained 67.56% of the total variance); see Appendix 5. ▪ Significant standardized factor loadings (range .63 to .92, $p < .01$); see Appendix 5. ▪ CFA results: Satisfactory fit [$\chi^2 = 1122.941$; $df = 664$; $p < .000$; RMSEA = .051; SRMR = .058; CFI = .945]; see Appendix 7. ▪ Intercorrelations of all 7 digital transformation leadership roles were acceptable (ranging from .49 to .77, $p < .01$); see Appendix 7. ▪ All factor reliability (FR) values, the Cronbach's alpha values, and the average variance extracted (AVE) scores exceeded the recommended thresholds (Bagozzi and Yi, 1988; Nunnally, 1978); see Appendix 7. ▪ All seven constructs met Fornell and Larcker's (1981) criterion for discriminant validity; see Appendix 7. ▪ Substantiating the factorial validity of the digital transformation leadership roles as a seven-factor model by testing three different alternative models; see Appendix 8.
	Study to test the predictive validity	<ul style="list-style-type: none"> ▪ Results show evidence supporting the predictive validity of the scale

	<ul style="list-style-type: none"> ▪ Sample size: n = 263 employees (Sample A); n = 294 employees (Sample B) ▪ Ordinary least square regression (OLS) 	measuring the digital transformation leadership roles; see Appendix 9.
Study 5: Spatial Arrangement of the Digital Transformation Leadership Roles	<p>MDS study to test the degree-of-fit between the identified leadership roles in digital transformation and the four CVF quadrants</p> <ul style="list-style-type: none"> ▪ Sample size: n = 196 leaders ▪ MDS technique 	<ul style="list-style-type: none"> ▪ Modification of the CVF roles and dimensions is needed

Note. Percentage of agreement comprises the average agreement across all items.

Table 3: Overview of the empirical studies.

3.6 The Spatial Arrangement of the Digital Transformation Leadership Roles

To test the degree-of-fit between the seven digital transformation leadership roles and the four CVF quadrants (Denison et al., 1995; Quinn & Rohrbaugh, 1981; Vilkinas & Cartan, 2006), we conducted another study with 165 leaders (Study 5) and performed multidimensional scaling (MDS). Due to the companies' data protection policies, we were only allowed to collect information on the leaders' hierarchical level. In terms of the hierarchical level, the majority of the leaders (67.88%) headed a business unit. We measured the seven digital transformation leadership roles using the 39 developed items. The leaders reported their own digital transformation leadership behaviors using Likert scales ranging from 1 = *strongly disagree* to 7 = *strongly agree*.

Focusing on the MDS as a visualization technique, mean scores were calculated for each of the seven digital transformation leadership roles (Vilkinas & Cartan, 2006). Based on these mean scores, the MDS was conducted using SPSS PROXSCAL. The results of the MDS indicate a two-dimensional solution. The four quadrants are partly consistent with Quinn's (1988) original CVF quadrants. More specifically, the horizontal axis (dimension 1) supports the interpretation of an internal-external focus (Hooijberg & Choi, 2000). The results show that the enabler, the mentor, the digital mentee, and the manager are internally focused roles characterized by developing internal human resources (mentor), setting up internal teams (enabler), internal reverse men-

toring (digital mentee), and managing internal tasks and processes (manager). In contrast, the digital pioneer, the innovator, and the networker are externally focused roles. Both the digital pioneer and innovator need to be well-informed about current market trends and competitors. Moreover, the networker builds and establishes beneficial relationships external to the organization that provide information and resources.

The vertical axis (dimension 2) does not support Quinn's (1988) stable-flexible interpretation because turbulent business environments like digital transformation require leaders to interact solely in a flexible organizational context (Bennett & Lemoine, 2014). Instead, the results indicate that the vertical axis is better represented by a task-relation orientation, which is in line with the reformulation of Vilkinas and Cartan (2006). Task-oriented and relation-oriented leadership behavior is important in organizational change processes (Battilana et al., 2010), which makes them crucial in the context of digital transformation. We specify that task-oriented leadership behavior particularly includes the promotion of innovation and digitalization. In contrast, relation-oriented leadership behavior focuses on motivating and enabling employees (Battilana et al., 2010), who are essential to successfully implement organizational change (Kim et al., 2011). The quadrants focusing on task-oriented leadership behavior comprise the digital pioneer, the innovator, the manager, and the digital mentee. These roles are characterized by tasks such as identifying the need for change (digital pioneer), implementing innovative ideas (innovator), and coordinating organizational processes (manager). We expected that the digital mentee role would be relation-oriented due to the digital-related knowledge transfer from the employees to the leader. However, the primary objective of task-oriented leadership behavior is to facilitate the process of accomplishing assigned tasks (Yukl, 2012), whereas relation-oriented leadership behavior aims to maintain interpersonal relationships by tending to others' welfare (Eagly & Johannesen-Schmidt, 2001). Therefore, the digital mentee is likely task-oriented rather than relation-oriented as s/he uses the exchange with her/his employees as means to an end to improve her/his own digital skills to help accomplishing an objective. The relation-focused quadrants contain the mentor, the enabler, and the networker. When performing the roles of an ena-

bler, a mentor, or a networker, leaders focus on human resources (e.g., developing skills or working in interdisciplinary teams as well as building and maintaining favorable relationships) and are concerned with employees' welfare.

The graphical representation (see Figure 7) of the digital transformation leadership roles demonstrates the assumed realignment of the roles appropriate in facing digital transformation.

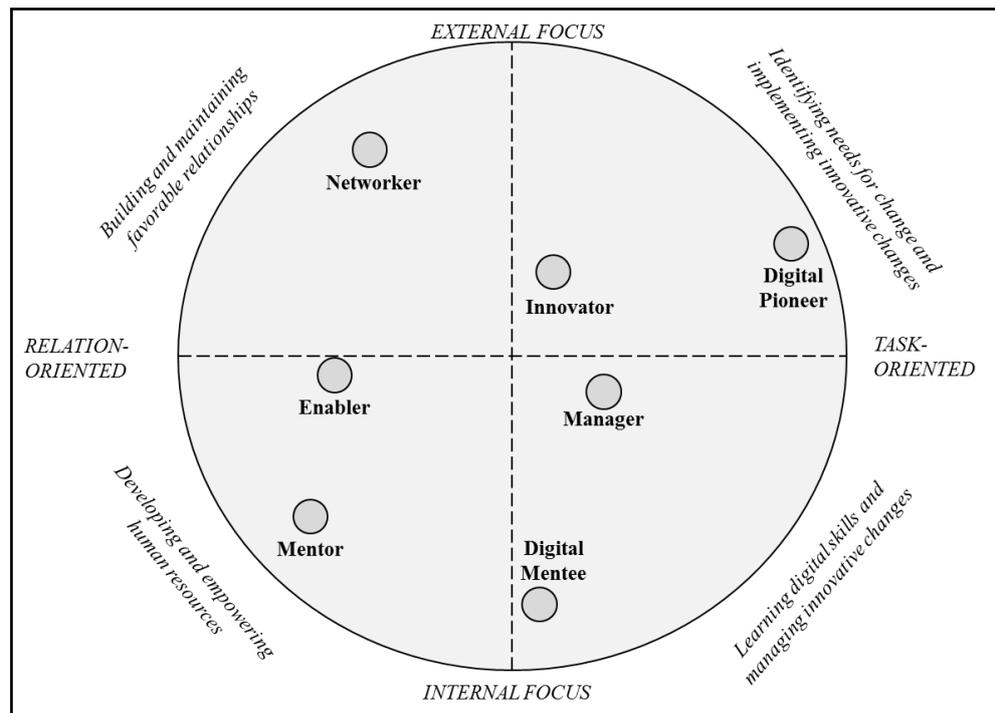


Figure 7: Digital Transformation Leadership Framework with its seven roles.

3.7 Discussion

This article contributes to leadership research in at least three important ways. First, we provide insight into leadership roles and behaviors specifically appropriate to a digital transformation context. The analysis reveals the need for a set of different, partially competing leadership behaviors, consisting of both already established but slightly modified leadership behaviors and entirely new ones especially required for facing the leadership challenges associated with digital transformation (e.g., leadership behaviors concordant with the digital pioneer and the digital mentee). The results show that the digital transformation leadership roles predominantly enhance the outcome variables related to digital transformation (i.e., innovative job performance, knowledge sharing,

and digital maturity). However, we discover that the innovator could have a dark side, pointing to a “double-edged sword pattern” (Diebig et al., 2016) in this digital transformation leadership role. The results show that employees’ perceptions of their leaders as innovators enhance their innovative job performance while simultaneously decrease their knowledge sharing activities. A closer look at the barriers of knowledge sharing reveals that employees might fear the loss of knowledge advantage when sharing ideas (Matschke et al., 2014) and even worry about jeopardizing their job security (Riege, 2005). Although the innovator encourages creative ideas, employees might see their developed ideas as a knowledge advantage in an uncertain environment and be reluctant to share them. This result emphasizes the potential negative consequences of well-intended leadership behavior. Nevertheless, due to the paradoxical challenges leaders face today, it is important for them to master a broad behavioral repertoire, even if it means exhibiting ambivalent roles.

Second, we contribute to the scarce research on leadership in the digital era by developing and testing a measure that captures the different digital transformation leadership roles. Based on a complex scale development process, we introduce a new measure, which fulfills all reliability and validity thresholds, to the leadership literature. Researchers might apply this measurement scale in further studies concerning leadership in the digital era.

Third, we extend the CVF literature (e.g., Cameron et al., 2006; Vilkinas et al., 2020) by transferring the CVF into the context of digital transformation and refining it for this increasingly important business environment. Our findings reveal that new leadership roles emerge in the context of digital transformation (i.e., the digital pioneer and digital mentee roles). Some original CVF roles, such as the innovator or the mentor, are still relevant, but others have become less important (e.g., the manager). Also, some original CVF roles need a modification to better address the challenges of digital transformation (e.g., leadership behaviors such as facilitating flexible work structures or utilizing innovative working methods). Moreover, we complement existing CVF literature by showing that the original stable-flexible dimension (Quinn, 1988) is no longer supportable in a dynamic business environment since leaders have to interact solely in a flexible organizational context (Bennett & Lemoine, 2014). Hence, we redefine this dimension with a task-relation orientation, which is considered important for the implementation of change processes

(Battilana et al., 2010). In line with Vilkinas and Cartan's (2001) modification of a CVF dimension, the task-relation orientation perfectly fits the changing environment. Since almost every industry is affected by a dynamic business environment (Schoemaker et al., 2018), this advanced CVF model applies to many different industries, which indicates its generality. Thus, this model might be of special interest for further leadership research in the context of digital transformation.

3.7.1 Practical Implications

Our results indicate important managerial implications for leadership development. The qualitative study generates a set of leadership roles, which together are particularly relevant in the context of digital transformation. Thus, leaders should reflect on their leadership behavior by considering the value of adopting different leadership roles in digital transformation. Hence, leaders should (1) have the ability to exhibit all seven digital transformation leadership roles, (2) understand the roles to deploy them properly, and (3) be able to switch between the different roles. Prior studies on the CVF have shown that leaders who are able to perform different roles achieve higher leadership effectiveness (Tong & Arvey, 2015). Therefore, organizational actions should help leaders to develop the three critical skills mentioned above.

Leadership development programs should be offered to train leaders' abilities to take on all seven digital transformation leadership roles by showing where they have weaknesses and reducing these through individual or group training sessions that help to develop the necessary behavior. Furthermore, we recommend that organizations give leaders space to experiment in applying the digital transformation leadership roles so that they can learn and internalize the requisite behaviors.

The results of the MDS indicate that the digital transformation leadership roles have different orientations and purposes. Thus, organizations should provide leaders with information that supports them in understanding the leadership roles properly. For example, if leaders aim to develop and empower their employees, they should take on the enabler or mentor roles, whereas identifying needs for change and implementing them successfully requires leaders who focus on the digital pioneer or innovator roles.

Leadership development programs could be enriched by training that aims to develop leaders' ability to switch between the digital transformation leadership roles. A useful starting point could be role plays, either virtual or in-person, in which different leadership situations are simulated.

3.7.2 Limitations and Future Research

Several limitations of this study point to suggestions for future research. First, we lack sufficient knowledge on the influence situational contingencies have on the digital transformation leadership roles. Therefore, further research should investigate which specific leadership situations demand which leadership role(s). This agrees with McClean et al. (2019), who highlight the importance of future dynamic leader behavior research. For example, the organizational context (Porter & McLaughlin, 2006) is possibly a relevant situational contingency. To gain a better understanding, a first rewarding step could be to analyze the relationship between the digital transformation leadership roles and different leadership situations, organizational types, and objective performance variables with, ideally, an emphasis on digital transformation.

Second, there are notable limitations regarding the scale development process. Future research should pay more attention to potential endogeneity bias (Shockley et al., 2016). Although we intended to minimize possible common method biases through different techniques—for example, by guaranteeing the participants anonymity and psychologically separating the title predictor and the criterion variables (Podsakoff et al., 2003)—the estimates could still be biased. Therefore, we see a clear value in future research that uses further controls for CMV (see Antonakis & House, 2014). Furthermore, the conducted scale development process is based on cross-sectional study designs, which cannot reveal any changes in leadership behavior over time. Further studies might therefore use longitudinal data. Thus, although we conducted several empirical studies, complementary tests and replication studies are required to further validate the leadership scale.

3.8 Conclusion

In line with Avolio et al.'s (2014) call for rethinking leadership in the light of digital transformation, we identified leadership roles and behaviors that are

appropriate in confronting the leadership challenges associated with digital transformation. Based on our findings, we suggest that combining new roles with more traditional roles is key to successfully master digital transformation. We encourage future research to use our framework as a basis to advance our understanding of leadership in the digital era, especially regarding the influence of context-related variables. Furthermore, we hope this research inspires leaders to reflect on their leadership behavior and supports them by showing the value of adopting different digital transformation leadership roles in this important but turbulent business environment.

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Chapter 4

Uncovering the complexities of remote leadership and the usage of digital tools during the COVID-19 pandemic – A qualitative diary study

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4. Uncovering the Complexities of Remote Leadership and the Usage of Digital Tools during the COVID-19 Pandemic – A Qualitative Diary Study³

4.1 Introduction

The global health and economic crises related to the COVID-19 pandemic have led to extensive social distancing rules to reduce the spread of the coronavirus (Bick et al., 2020). To avoid physical contact and control the risk of spreading the virus at work, many organizations have required their employees to work from home (Brynjolfsson et al., 2020). In Germany, approximately 27% of employees worked from home during the first lockdown in April 2020, compared with 4% before the COVID-19 pandemic (Kohlrausch et al., 2021). The abrupt lockdown situation has forced rapid changes in daily routines and has made people quickly adapt to new circumstances and the intensive use of digital tools (Criscuolo et al., 2020). In the longer term, working from home could be the new normal (Sanchez, 2018), at least to some degree, for many office jobs (Criscuolo et al., 2020). Due to the COVID-19 pandemic, teams who were used to working together in an office environment have suddenly been separated. This extraordinary situation has made leadership quite challenging and complex. While research about e-leadership (Avolio et al., 2000; Cascio & Shurygailo, 2002) and virtual leadership (Hoch and Kozlowski, 2014; Liao, 2017; Ziek & Smulowitz, 2014; Zigurs, 2003) is already established, there is limited research about unforeseeable remote leadership during a pandemic crisis – especially, the effective usage of digital tools while leading from home is underexplored.

The COVID-19 pandemic is considered an accelerator of digital transformation in organizations (Bartsch et al., 2020). Scholars have recently started to investigate virtual leadership in the context of the global pandemic (e.g., Al Saidi et al., 2020; Bartsch et al., 2020; Bauwens et al., 2021). These

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studies analyze changed leadership in a changed world (Uhl-Bien, 2021) and show that in remote work environments, demonstrating task-oriented leadership behaviors, and even more so, relation-oriented ones, are relevant in handling the complex virtual challenges (Bartsch et al., 2020). However, these studies lack explanatory power. Some solely cover employees' perspective instead of leaders' perspective (e.g., Bartsch et al., 2020). Others only focus on sectors and industries directly impacted by the pandemic, such as health, education, and the government (e.g., Al Saidi et al., 2020; Bauwens et al., 2021; Sergent & Stajkovic, 2020).

As leadership is a daily and constantly changing phenomenon, we follow the call for further studies to explore daily leadership behaviors (Kelemen et al., 2020) and their effectiveness (Knippenberg et al., 2005). Specifically, we explore practices of exemplary remote leadership during the COVID-19 pandemic. Leadership practices refer to leaders' actions when doing their personal best (e.g., "highlights") to accomplish extraordinary feats in their organization (Dirani et al., 2020; Malhotra et al., 2007; Posner & Kouzes, 1988). Hence, we explore the daily experiences of leaders aiming to work effectively while using digital tools and performing their leadership practices remotely during the COVID-19 pandemic. The purpose of our study is to gain a better understanding of remote leadership during a pandemic crisis by addressing the following questions:

- (1) Which day-to-day leadership practices do leaders perform from home during the COVID-19 pandemic?
- (2) Which digital tools do leaders use to support their different leadership practices?
- (3) What factors influence the effectiveness of leadership from home with the aid of digital tools?

To answer these research questions, we employed an exploratory approach with the use of a qualitative study. Daily diary data were collected from 31 leaders who participated in a longitudinal study over a 5-work-day period, resulting in a total of 155 diaries. With this exploratory diary study, we contribute to the literature in at least three ways.

First, we add to the scarce literature on virtual leadership during crises by identifying day-to-day leadership practices from a leader's perspective and classifying them into four categories: 1) solve problems collaboratively and

monitor team progress, 2) create space for socializing and teambuilding, 3) make the team feel supported and encourage feedback, and 4) communicate to build a virtual culture of trust. Considering leaders' self-assessment of their leadership practices, our results indicate that leaders tend to focus on operational and team-oriented behaviors.

Second, we enrich the remote leadership literature by providing a detailed understanding about the usage and suitability of digital tools. Remote day-to-day leadership is complex, and leaders should be able to choose the right tools. The complexity of virtual leadership is shown not only by the variety of digital tools used by virtual leaders but also by their frequent reports about using unsuitable tools. Hence, leaders often need to switch tools between tasks or start using a combination of tools. Nevertheless, they tend to use video conferencing as the main digital tool since it works best in replacing face-to-face interactions and thus seems to be a suitable tool for many leadership practices.

Third, we contribute to the research on effective leadership in a challenging and unpredictable situation by identifying several factors that have positive or negative impacts on leadership effectiveness as leaders try to cope with crisis-specific challenges. For example, on one hand, our study identifies the introduction of meeting guidelines and a large number of personal interactions as drivers of effective leadership. On the other hand, the limited support of digital tools for creative and collaborative tasks and missing opportunities for socializing are recognized as barriers to effective virtual leadership.

4.2 Literature Review and Focus of the Study

Crisis leadership

Identifying a situation as a "crisis" varies according to individual viewpoints; however, according to Grint (2005), a crisis can be defined as a critical problem with little time for decision making and action. This scenario is where leaders find themselves during the COVID-19 pandemic, in which the decision to work from home had to be made abruptly. Crisis leadership has been targeted by scholars even before the COVID-19 pandemic, showing the importance of leaders' ability to render the environment suitable for their intended

strategies (e.g., Grint, 2005). In sum, these researchers have arrived at a consensus about the increasingly complex and dynamic environment where leaders must navigate. However, the uncertainties triggered by the current global pandemic have added to the complexity of leadership, which has suddenly taken place in a virtual setup (Bartsch et al., 2020) that has not been taken into account in previous studies.

Virtual leadership

The two main characteristics that distinguish between virtual and conventional teams are the spatial distance and the technologically mediated communication (Bell and Kozlowski, 2002). Based on existing research and in the context of our paper, we define virtual or remote leadership as leading in a (geographically) dispersed work environment, where employee interaction is based on digital tools (Bartsch et al., 2020; Huang et al., 2010). Scholars have investigated different facets of virtual (team) leadership, independent of the COVID-19 pandemic, as follows: e-leadership (e.g., Avolio et al., 2014; Cascio & Shurygailo, 2002), transformational leadership and virtual teams (e.g., Hambley et al., 2007; Hoch & Kozlowski, 2014), virtual teams (e.g., Gupta & Pathak, 2018; White, 2014), virtual leadership challenges (e.g., Bell & Kozlowski, 2002; Mehtab et al., 2017) and leadership effectiveness (e.g., Kayworth & Leidner, 2002; Malhotra et al., 2007). This large body of research emphasizes the specifics of leading at a distance. For example, Bell & Kozlowski (2002) identify two key leadership functions in virtual teams: performance management and team development. However, the existing literature has scarcely examined the complexities of virtual leadership induced by a crisis.

Leadership and technology

So far, a few studies have begun to investigate the impact of technology on leadership (e.g., Cortellazzo et al., 2019; Larson & DeChurch, 2020). Empirical studies show that digital tools could significantly contribute to problem solving and monitoring processes (e.g., Cortellazzo et al., 2019). Although recent research paper structure existing work and offer some suggestions about leading teams in the digital era (Cortellazzo et al., 2019; Larson & DeChurch, 2020), these studies have limited practical explanatory power about the usage of digital tools in supporting virtual leadership practices.

In sum, scholars have largely investigated different aspects of leadership in recent years, including e-leadership and virtual leadership. However, the effective usage of digital tools while leading from home remains underexplored. Regarding the rapid advances of technology, Larson & DeChurch (2020) call for a new genre of leadership scholarship. Moreover, little empirical work has explored leaders' perspective. Our work addresses this research gap by investigating the intersection of crisis leadership, virtual (team) leadership induced by the COVID-19 pandemic and the usage of digital tools from leaders' perspective.

4.3 Method

The research questions call for an approach that allows examining daily leadership behaviors in their natural context and captures the actual experiences of leaders who use digital tools remotely (Kelemen et al., 2020). Hence, we have conducted an exploratory study to build a comprehensive understanding of day-to-day leadership practices and therefore study leadership in its natural setting. Our work is characterized by an explorative, inductive research approach in form of a qualitative diary study. Compared with many studies including students or employee perspectives, our study involves leaders' self-reports about highlights and lowlights when leading from home during the COVID-19 pandemic.

Studying leadership on a daily basis brings several important theoretical and methodological advantages. First, qualitative daily diaries capture the leaders' immediate and spontaneous assessment of their daily experiences, using digital tools to support leadership practices (Bolger et al., 2003; Patterson, 2005; Poppleton et al., 2008). Daily diaries allow researchers to be as close as possible to the actual experience and capture the context, as well as leadership practices and feelings (Kelemen et al., 2020). Second, examining daily leadership practices allows researchers to explore the complexity of short-term leadership processes, which vary from one day or leadership situation to another (Kelemen et al., 2020). Daily diaries allow researchers to access a detailed in-depth examination of the rationale behind and consequences of leadership (Kelemen et al., 2020). Third, an in-depth qualitative analysis enables the exploration of new and important findings (Radcliffe,

2013), including the discovery of challenges during the recent COVID-19 pandemic.

The diaries

In the first step, the diary study was piloted with three leaders and then consecutively rolled out over a seven-week period. Using UNIPARK Quest-back software to technically conduct the diary study turned out to be useful in providing the participants with a web and mobile frontend. The diary was structured into the following parts:

- The introduction included information about the study design and general information about the study (e.g., study set-up, General Data Protection Regulation).
- The main part contained two further sections about the highlights and the lowlights of the work day, analogous to the critical incident technique (Flanagan, 1954). The sections were designed as free text fields. The two sections were each structured into six sub-sections to offer some guidance and make the answers more comparable. After ensuring that the participants provided their reflecting on their job-related activities during the work day, considering their tasks and practices as leaders, we asked them to describe (1) the digital tools they used, (2) for which leadership practices they used the tools, (3) their motivation for using the listed digital tools, (4) their feelings during the usage, (5) how effective the usage was and (6) how they would handle the situation when not working remotely. Questions (3) and (4) were asked in particular to reinforce the mental process of putting the leaders back into the specific situation and thereby allow capturing their practices and motivation about the usage and suitability of digital tools close to their “life as it is lived” (Bolger et al., 2003, p. 580). Finally, they were offered the possibility to leave additional remarks (see the Appendix 10 and 11). The ordering of the highlights and the lowlights was varied from day to day to reduce possible order effects (Poppleton et al., 2008). The main part was repeated for another four work days.
- The final part included person-related and company-related demographics, as well as information about the following study days.

Sample

The sample consisted of 31 leaders who managed to participate over a 5-work-day period, which led to a total of 155 diaries. While recruiting participants for the study, we kept in mind that the chosen method was time consuming and required a high level of dedication from them (Radcliffe, 2013). Despite these constraints, we sought to obtain a highly diverse sample in order to explore a broad range of leadership experiences. The sample was especially diverse in terms of gender, age, and work experience (see Table 4). The digital diary format likely attracted the interest of more digital-savvy leaders, which might have resulted in their self-assessment of 5 out of 7 in digital progressive-ness. The data were gathered in Germany between April and May 2020. All participants were volunteers, mainly recruited via private networks and LinkedIn.

Gender	female = 14; male = 17
Age	MV = 40 years (28–61)
Work experience	MV = 15 years (2–35)
Employees	MV = 13 employees (1–100)
Assessment of own progressiveness regarding the use of digital tools	MV = 5 (scale: 1 = low; 7 = high)
Home office before COVID-19	MV = 10% (0–50%)
Industries or professions	financial services (48%), law (10%), media (10%), commercial sector (7%), real estate (7%), automotive (3%), consulting (3%), education (3%), engineering (3%), health (3%), other (3%)

Note. MV = mean value

Table 4: Sample consisting of 31 leaders who participated over a 5-work-day period.

Procedure

The diaries were completed over a five-work-day period, either in the morning or in the evening. The participants received personalized daily follow-up e-mails to remind them to fill in the diary. Some leaders who worked part

time or had days off did not participate for five consecutive days but continued until they completed five work days.

Data analysis

Template analysis was used to answer the research questions (King, 1998, 2004). This method is typically applied in research analyzing qualitative diary studies (Poppleton et al., 2008; Radcliffe, 2013; Radcliffe & Cassell, 2015). When working with templates in the thematic analysis of text, researchers generate a list of codes (template), representing the identified themes in their data (King, 2004). The main characteristic of template analysis is that some codes are produced *a priori* and then modified during the iterative coding procedure (King, 2004). The data analysis was conducted using the qualitative research software MAXQDA 2020.

To guide the analysis, template analysis typically starts with a set of predefined codes (King, 2004). As a starting point, the initial template for our study was created based on the insights from the literature review and the questions for the diaries. The initial template consists of three highest-order codes – (1) leadership practices, (2) digital tools used, and (3) factors influencing the use of digital tools – subdivided into one or two levels of lower-order codes (Table 5). The distinction between task- and relation-oriented leadership practices is based on previous findings emphasizing the relevance of both for leadership in virtual work environment (Bartsch et al., 2020; Liao, 2017).

I. Leadership practices

1. Task-oriented

- a. Problem solving
- b. Monitoring KPIs

2. Relation-oriented

- a. Teambuilding
- b. Communicating
- c. Supporting
- d. Socializing
- e. Mentoring
- f. Networking

II. Digital tools used

- 1. Video call
 - 2. Call
-

-
3. E-mail
 4. Chat
 5. Collaboration tools
-

III. Factors influencing the use of digital tools

1. Effective

- a. Preparation
- b. Personal interaction (virtually)
- c. Over-communication

2. Ineffective

- a. Cameras off
 - b. Missing opportunities for socializing and feedback
 - c. One-way communication
-

Table 5: Initial template.

In the following step, the diaries were reviewed systematically to identify the sections of text relevant to the identified codes and research questions. First, the text sections were marked with one or more of the corresponding codes of the initial template. Second, changes were made to the template by adding or deleting codes and merging codes into groups. During this process, hierarchical coding was applied, meaning that groups of similar codes were clustered to produce more general higher-order codes (King, 2004). In general, higher-order codes represent broad themes, and lower-order codes signify more narrowly focused themes (King, 2004; Radcliffe & Cassell, 2015).

After all diary data had undergone a second analysis, the diaries were reviewed two more times to fine-tune the template by further adding or deleting codes and merging codes into groups (King, 2004). Finally, several themes were grouped together in a more insightful and informative way to gain relevant insights on the research questions (Radcliffe, 2013). After all diaries had been read through at least four times, the researchers decided to stop the iterative process and commit on a final template (see Table 6), which served as the basis for interpreting the data, which had all been coded this way (King, 2004).

I. Leadership practices

1. Task-oriented

- a. Solve problems collaboratively and monitor team progress
 - i. Conducting meetings and workshops
 - ii. Holding collaborative work sessions
 - iii. Prioritizing tasks
 - iv. Assigning responsibilities
-

-
- v. Monitoring key performance indicators (KPIs)

2. Relation-oriented

- a. Create space for socializing and teambuilding
 - i. Teambuilding
 - ii. Mood tracking
 - b. Make the team feel supported and encourage feedback
 - i. Giving and receiving feedback
 - ii. Mentoring
 - iii. Recognizing good work
 - iii. Empowering employees to make decisions
 - iv. Motivating the team
 - c. Communicate to build a virtual culture of trust
 - i. Informing
 - ii. Over-communicating
-

II. Digital tools used

1. Solve problems collaboratively and monitor team progress

- a. Variety
 - i. Video conference
 - ii. Screensharing
 - iii. E-mail
 - iv. Collaboration tools (e.g., JIRA, Confluence)
- b. Suitability
 - i. Routine/ daily business
 - ii. Missing human factor

2. Create space for socializing and teambuilding

- a. Variety
 - i. Video conference
 - ii. Screensharing
 - iii. Conference calls
 - iv. E-mail
 - v. Messenger
 - vi. SharePoint
- b. Suitability
 - i. Seeing one another via video
 - ii. (Virtual) interaction via video
 - iii. Face-to-face meetings preferred

3. Make the team feel supported and encourage feedback

- a. Variety
 - i. Video conference
 - ii. Conference calls
 - iii. Screensharing
 - iv. Messenger
- b. Suitability
 - i. Face-to-face meetings preferred

4. Communicate to build a virtual culture of trust

-
- a. Variety
 - i. Video conference
 - ii. Messenger
 - b. Suitability
 - i. Two-way communication
 - ii. Face-to-face meetings preferred
-

III. Factors influencing the use of digital tools

1. Solve problems collaboratively and monitor team progress

- a. Drivers
 - i. Meeting preparation
 - ii. Meeting guidelines/conference rules
 - iii. Sharing digital notes
 - iv. Moderator role
- b. Barriers
 - i. Cameras off
 - ii. Limited support for creative and collaborative tasks

2. Create space for socializing and teambuilding

- a. Drivers
 - i. Personal interaction
 - ii. Seeing one another (virtually)
- b. Barrier
 - i. Missing opportunities for socializing

3. Make the team feel supported and encourage feedback

- a. Driver
 - i. Ad hoc support
- b. Barriers
 - i. Less opportunities for ad hoc feedback
 - ii. Technical difficulties

4. Communicate to build a virtual culture of trust

- a. Driver
 - i. Over-communication
 - b. Barriers
 - i. Asynchronous communication
 - ii. One-way communication
-

Table 6: Final template.

4.4 Findings

In this section, we answer the research questions by interpreting the coded data and recognizing the patterns. The objective is to identify the main themes that are most relevant to our research questions, as well as select some illustrative quotes (King, 2004). Hence, in the following paragraphs, we present the major themes related to the research questions.

RQ 1: Which day-to-day leadership practices do leaders perform when leading from home during the COVID-19 pandemic?

First, we bundle a set of codes related to task-oriented leadership practices (Bartsch et al., 2020). For example, our study results reveal leadership practices related to “conducting meetings and workshops”, “holding collaborative work sessions”, “prioritizing tasks”, “assigning responsibilities” and “monitoring key performance indicators (KPIs)”. These codes are grouped under the first meta-category of leadership practices, which we name “solve problems collaboratively and monitor team progress”. Leadership practices on both strategic and more operational levels are included under this meta-category. To specify, leaders do not only act on the strategic level by monitoring results and team performance, but even more, they spend a lot of time on the operational level, for example, by guiding virtual meetings to ensure that virtual collaboration works and clarifying who does what until when, or even performing operational tasks on behalf of their team members to resolve virtual collaboration issues and improve employees’ task outcomes. The following are examples under this meta-category:

“Supporting one of my employees regarding time management and then we developed an activity plan together” (Leader_31, Item 2, Day 4).

“I [...] could have given her more background knowledge on the topic in a personal conversation in the office, where we would have discussed the points together, and in the best case, she would have made the corrections, then integrated them into the documents herself” (Leader_15, Item 13, Day 1).

Second, we structure the codes related to relation-oriented leadership practices (Bartsch et al., 2020) and identify three categories. The diary data reveal leadership practices such as “teambuilding activities”, and “mood tracking of the team”, which we summarize under the meta-category “create space for socializing and teambuilding”. When leaders describe these leadership practices, they tend to enact leadership on the team level. Here are two examples reported in the diaries:

“Capturing the current mood of the team, working from home now for six weeks” (Leader_12, Item 2, Day 4).

“Today it was all about teambuilding” (Leader_27, Item 2, Day 5).

Third, the diary data show further relation-oriented leadership practices, namely “giving and receiving feedback”, “mentoring”, “recognizing good work”, “empowering employees to make decisions”, and “motivating the team”. We

label them “make the team feel supported and encourage feedback” leadership practices, illustrated by these examples:

“I gave feedback to my employee and recognized his good performance” (Leader_24, Item 2, Day 3).

“Today I had a meeting with my mentee” (Leader_27, Item 2, Day 2).

“I had to coach my team leader how to handle a difficult issue with one employee” (Leader_10, Item 2, Day 4).

Fourth, “informing” and “over-communicating” comprise the “communicate to build a virtual culture of trust” leadership practices. Examples are as follows:

“Informing employees about the opportunities for short-term work programs and discussing these with them” (Leader_20, Item 2, Day 3).

“Communication of important changes within the team” (Leader_05, Item 10, Day 1).

To sum up, the remote leadership practices exhibited by the participants point out an operational and team-oriented focus (e.g., moderating meetings and workshops or teambuilding).

“The effort for me as a moderator of the meeting was higher, since there was less discussion due to the remote set-up” (Leader_23, Item 5, Day 5).

“We ended the week today together as a team” (Leader_17, Item 2, Day 4).

Table 7 shows the definitions of the specified meta-categories of leadership practices when leading from home during a global pandemic.

Remote leadership practice	Operating definition¹
<i>Solve problems collaboratively and monitor team progress</i>	Organize and coordinate virtual teamwork, solve problems collaboratively and deal with work disruptions by conducting meetings and workshops to clarify questions, holding collaborative work sessions, prioritizing tasks, assigning responsibilities and tasks, and monitoring key performance indicators.
<i>Create space for socializing and teambuilding</i>	Plan time for virtual socializing and teambuilding, show empathy, and regularly checking on employees' mood.
<i>Make the team feel supported and encourage feedback</i>	Make the team feel supported and empower employees to make good decisions by mentoring and providing feedback, recognizing good performance, and motivating the team.
<i>Communicate to build a virtual culture of trust</i>	Build a virtual culture of trust by communicating rather than controlling, informing, and over-communicating.

Note. ¹Based on 155 diaries

Table 7: Definitions of the four remote leadership practices that are common during the COVID-19 pandemic.

RQ 2: Which digital tools do leaders use to support their different leadership practices?

In addition to the variety of leadership practices, the complexity of day-to-day leadership is shown by the diversity and suitability of digital tools used by leaders leading from home. The complexity of the day-to-day leadership practices is shown in our data by the challenge faced by the leaders in their choice of the right digital tool to match their objective. Additional indicators of complexity are using a combination of different tools and switching between tools, sometimes even in a single leadership task, for example:

“Very good and very interactive because the participants were able to ask questions in the live chat in parallel to the presentation” (Leader_27, Item 5, Day 4).

“A video conference would probably have been the most useful. But during the stressful day today, I thought I didn’t have time. So probably even more time was wasted with e-mail, phone calls and WhatsApp chat to solve the task within the team” (Leader_12, Item 16, Day 5).

“Since the goal, while using the digital tool increasingly, turned out to be unachievable, the e-mail writing was stopped, and I picked the mobile phone to call and solve the task in dialogue. In this situation, I realized too late that complex issues could not be clarified quickly and efficiently in communication via email” (Leader_03, Items 12 + 13, Day 5).

We use the four identified meta-categories to examine the variety and suitability of digital tools supporting day-to-day leadership practices. First, our findings reveal that when leaders show leadership practices related to the meta-category “solve problems collaboratively and monitor team progress”, they tend to feel confident about using a broad range of digital tools, such as video conferencing, screensharing, e-mail or collaboration tools. Some leaders who report these kinds of leadership practices tend to describe the use of digital tools as “routine” or “daily business”. In their diaries, they also mention their tendency to use the same digital tools when working remotely or in the office for problem solving and monitoring leadership practices, since they have used digital tools for task management (e.g., JIRA) even before the global pandemic, for example:

“...the same tools – no difference between home office and work in the office; only difference: personal contact is not possible [when] working remotely” (Leader_18, Item 6, Day 1).

“If not working remotely, I would use digital tools in the same way because I work in a decentralized organization” (Leader_25, Item 6, Day 2).

Even if digital task management seems to work well remotely, the suitability is limited since the “human factor” is often missing, for example:

“The factual level can be handled very well, but the human factor is missing a bit [...]” (Leader_25, Item 8, Day 5).

Second, the diaries reveal that when leaders report leadership practices related to the meta-category “create space for socializing and teambuilding”, they tend to use video conferencing as the main digital tool. The diaries demonstrate the suitability of video conferencing for remote leadership since it enables leaders and team members to see one another and interact on a more personal level, for example:

“As a leader, I get to know my employees in their private environment and see their homes in the background during video calls. That brings me closer to the employees, and I also become more approachable – if, for example, the stepdaughter waves at the camera” (Leader_31, Item 8, Day 1).

“We decided to use Zoom for our team jour fixe since it allows us to meet in large groups, and participants can see one another via video” (Leader_02, Item 5, Day 2).

“Reaching and seeing the entire team at the same time was important for me; that’s why we used MS Teams with video” (Leader_31, Item 16, Day 1).

“Being able to see every one of the team via Zoom and keeping the team motivated through increased personal interaction” (Leader_11, Item 3, Day 1).

Furthermore, leaders report using additional digital tools, such as screensharing, conference calls, e-mail or messenger, to foster personal interactions within the team. They also mention using SharePoint as a data management tool to enable team collaboration. If not working from home, leaders report that they would meet in person without using any digital tools.

Third, the diaries reveal that leaders use video conferences or conference calls in combination with screensharing for the “make the team feel supported and encourage feedback” leadership practices such as mentoring or providing feedback. For giving due recognition to the team, messenger is used to quickly offer compliments on good work results. In their diaries, leaders explain that especially for (critical) feedback, they would assess personal meetings in the office as more suitable. One example reported in the diaries is the following:

“We used Skype VC and screenshare for an individual meeting with my mentee. This worked out quite well since we had direct face-to-face communication and were able to work on an action plan” (Leader_27, item 1, Day 2).

Fourth, the analysis of the diary entries related to the “communicate to build a virtual culture of trust” leadership practices show the leaders’ tendency

to use different digital tools, such as video conferencing or messenger. Furthermore, the leaders find two-way communication more suitable for communicating changes. Again, they would prefer face-to-face meetings over technology-mediated communication, for example:

“For short-term communication of important changes, I used our standard messenger tool [Slack] to communicate fast. I felt very annoyed and disappointed, since it was a one-way communication with a lot of room for misunderstanding. This asynchronous communication was ineffective since my objective was only partially [achieved]. I would have definitely preferred a face-to-face meeting with my employees” (Leader_05, Items 10–13, Day 1).

To sum up, across all four meta-categories, leadership practices are shown with the support of a variety of digital tools, such as conference calls, collaboration tools, e-mail or screensharing, while video conferences should be emphasized as the most suitable tool for many remote leadership practices. However, except for task-oriented leadership practices, leaders would prefer face-to-face communication for all three relation-oriented categories.

RQ 3: What factors influence the effectiveness of leadership from home with the aid of digital tools?

Analyzing the diary data reveals that several factors have positive or negative impacts on leadership effectiveness when leading from home and using digital tools. Building on previous research, we define effective leaders as those who can “motivate and direct” their team members “towards organizational goals” and to “maintain stability and group harmony”, especially during change processes (Van Knippenberg & Hogg, 2003, p. 244). We summarize the positive and the negative factors under the terms ‘drivers’ and ‘barriers’, respectively. In the following sub-sections, we outline the key insights gained from the diaries, structured according to the four known meta-categories of leadership practices (see Table 8).

Meta-categories of leadership practices	Drivers	Barriers
Solve problems collaboratively and monitor team progress	<ul style="list-style-type: none"> ▪ Establish meeting guidelines ▪ Share digital notes 	<ul style="list-style-type: none"> ▪ Video cameras off ▪ Limited support of digital tools for creative and collaborative tasks
Create space for socializing and teambuilding	<ul style="list-style-type: none"> ▪ Personal interactions/seeing one another 	<ul style="list-style-type: none"> ▪ Missing opportunities for socializing

Make the team feel supported and encourage feedback	<ul style="list-style-type: none"> ▪ Ad hoc support 	<ul style="list-style-type: none"> ▪ Less opportunities for ad hoc feedback ▪ Technical difficulties
Communicate to build a virtual culture of trust	<ul style="list-style-type: none"> ▪ Over-communicating 	<ul style="list-style-type: none"> ▪ Asynchronous communication ▪ One-way communication

Note. Illustrative representation based on the 155 diaries.

Table 8: Findings about RQ 3 – Summary of qualitative analysis of key drivers and barriers related to leadership effectiveness.

Drivers of remote leadership effectiveness

When leaders describe “solve problems collaboratively and monitoring team progress” practices in their diaries, they highlight several experiences regarding effectivity. Many of their experiences can be summarized as constituting one key driver of remote leadership effectiveness – leveraging remote meetings requires sufficient preparation (e.g., defining the moderation role in a meeting). More precisely, establishing remote meeting guidelines or conference rules in advance contributes to effective leadership. Moreover, taking advantage of sharing digital notes supports effective leadership.

“The moderation and the conference rules contributed to this good outcome” (Leader_03, Item 5, Day 5).

“[...] the tool helped to clarify our well-prepared points” (Leader_08, Item 5, Day 1).

“See one another and write and share public notes” (Leader_06, Item 5, Day 1).

“We would have met in person and possibly only made handwritten notes [instead of digital notes], which would have been less efficient” (Leader_27, Item 6, Day 2).

The key driver identified regarding the meta-category “create space for socializing and teambuilding” constitutes personal interactions. Seeing one another in remote meetings seems highly relevant to effective socializing and teambuilding. This driver is mainly related to video conferencing. Leaders describe situations where they are able to interpret their team members’ communication and mood only when they see the latter’s faces via video.

“Very good if both sides use video” (Leader_27, Item 5, Day 1).

“Being able to see every [member] of the team via Zoom and keeping the team motivated through increased personal interaction” (Leader_11, Item 3, Day 1).

One other key driver concerning the meta-category “make the team feel supported and encourage feedback” is revealed. When leaders are handling

many things in parallel, providing ad hoc support via messenger increases effective leadership. Leaders can quickly react to questions or send feedback.

“We could clarify open questions in only a few messages in our chat, and I make sure to not be a bottleneck for my employees’ progress on this important task” (Leader_13, Item 4, Day 3).

Another key driver related to the meta-category “communicate to build a virtual culture of trust” can be identified in the diary data. In cases of interactions with their employees, leaders mention that over-communicating contributes to leadership effectiveness. If possible, leaders communicate tasks or situations one more time, just to make sure to avoid misunderstandings.

“[...] all questions could be clarified; however, the communication [...] took longer than usual in a personal conversation” (Leader_12, Item 5, Day 3).

Barriers to remote leadership effectiveness

In addition to drivers, several roadblocks may arise when leading from home. Related to the meta-category “solve problems collaboratively and monitor team progress”, based on our qualitative analysis, the key barrier is that in remote meetings, some employees tend to keep their video cameras off, which can lead to less engagement. When the video function is not or only partially used, there are less contributions in meetings, impairing leadership effectiveness. The leaders identify the digital tools’ limited support for creative and collaborative tasks as an additional barrier to effective “solve problems collaboratively and monitoring team progress” leadership practices. Quite often, leaders report difficulties in using digital tools for more creative and collaborative tasks.

“That was actually the first time today that I had the feeling that employees via MS Teams like to sit back and step back from their responsibilities by turning off the camera” (Leader_31, Item 16, Day 5).

“[Using] MS Teams is difficult when creating a collection and working collaboratively within the entire team at the same time. For example, due to the amount of data, no design ideas can be shared and evaluated together. So, in the creative field, I’m reaching my limits here” (Leader_31, Items 3 + 9, Day 1).

Regarding the meta-category “create space for socializing and team-building”, missing opportunities for socializing is described as a main barrier to effective remote leadership. During busy days, when leaders find themselves in back-to-back meetings, the time for socializing is missing.

“Time for a private conversation with my employees during lunch break or after work beer is missing” (Leader_06, Item 14, Day 3).

Regarding the meta-category “make the team feel supported and encourage feedback” leadership practices, leaders identify having less opportunities for ad hoc feedback as another key barrier. Additionally, when working collaboratively in one document (e.g., to conduct quality assurance) and synchronization is not working in real time, the collaboration is ineffective.

“The meeting was not so effective. I wanted to give some feedback to my employee after the appointment. Usually, I do this when I leave the meeting room, but it didn’t work that way [when] working from home. And after the meeting, I couldn’t call because we both had follow-up meetings” (Leader_24, Item 13, Day 4).

“I felt stressed because the sync of our SharePoint was not working and some updates hadn’t been saved” (Leader_27, Item 10, Day 4).

Another key barrier is identified in the diary data, related to the meta-category “communicate to build a virtual culture of trust”. Asynchronous communication, as well as one-way communication, tends to be a barrier to effective remote leadership practices related to communicating change.

“To communicate important changes, I used Slack, which is an established tool in our organization. Unfortunately, the communication was not effective at all because there was no real-time dialogue possible. Also, it turned out to produce misunderstandings, and some employees did not even react at all to my message” (Leader_05, Item 12, Day 1).

In sum, the diary findings prove that the usage of every digital tool can contribute to effective remote leadership, depending on the leadership practice and the specific usage of the tool. Nevertheless, video conferences dominate across all leadership practices, as well as the usage of a combination of digital tools, rather than a single tool. Video conferencing allows attendees to see one another, have personal interactions and get a better sense of someone’s mood. Moreover, employees are more engaged when their cameras are on, and two-sided communication with real-time interaction can take place. Generally, the diaries reveal that remote leadership tends to be more effective if the decision about digital tool use is well considered, depending on the leadership practice. In this case, each digital tool or combination of digital tools can have a positive impact on remote leadership.

4.5 General Discussion

Theoretical implications

Our study offers several theoretical contributions to the scarce literature on the use of digital tools to effectively perform leadership practices while leading from home during a global pandemic. First, we use a trending study that has been set up based on longitudinal data from qualitative diaries and thereby classify remote leadership practices into four meta-categories: solve problems collaboratively and monitor team progress, create space for socializing and teambuilding, make the team feel supported and encourage feedback, and communicate to build a virtual culture of trust. Whereas the first meta-category is predominantly task-oriented, the other three are predominantly relation-oriented. Our study's findings indicate a focus on operational leadership practices related to task orientation, as well as a team-oriented focus with respect to "monitor team progress", "teambuilding" and "make the team feel supported". One explanation for the focus on the former might be the remote leaders' restricted ability "to monitor team member performance" and to solve problems due to the missing face-to-face interactions when leading from home (Bell and Kozlowski, 2002). These remote leadership challenges tend to cause the fear of loss of control and consequently, increase the pressure to maintain the operative business and closely monitor KPIs (Bell & Kozlowski, 2002). The focus on more team-oriented leadership practices (e.g., teambuilding) might result from the loss of the sense of belonging (Yarberry & Sims, 2021). When leaders work from home, they can contribute to teambuilding by ensuring that enough time is allotted to doing so and socializing, for example, building a shared view of objectives and commitment to a collaborative team culture (Holton, 2001). Virtual leaders find themselves in this position to maintain the team culture, motivate the team and create a shared goal commitment (Bell and Kozlowski, 2002). Virtual team work also benefits from an active feedback culture, which helps create a clear understanding of expectations and provides transparency and support on individual and team levels, since in a virtual environment, employees cannot see what their colleagues are doing (Geister et al., 2006). Moreover, in new organizational arrangements, such as the abrupt home office situation, trust is a crucial element of virtual teams (Bell and Kozlowski, 2002;

Jarvenpaa et al., 1998). Meaningful and frequent interactions create the fundament to build trust (Holton, 2001). Over-communication is identified as a key success factor for virtual teams (Hunsaker & Hunsaker, 2008). With the four identified meta-categories of leadership practices, we expand previous virtual and crisis leadership literature (e.g., Bell & Kozlowski, 2002) that has identified performance management and team development as the two key leadership functions in virtual teams. In line with Bartsch et al. (2020), we underpin the relevance of task and relation orientations in a virtual environment during a crisis, whereas our results emphasize the focus on relation-oriented leadership practices.

Second, we provide a detailed understanding about the support of digital tools for daily leadership practices while leading from home during the COVID-19 pandemic. For each of the four identified meta-categories, we outline which digital tools are used by leaders when leading from home. Thereby, we expand existing research stating that digital tools mainly contribute to problem solving and monitoring activities (Cortellazzo et al., 2019). Moreover, we explore the suitability of digital tools when leading from home. This analysis contributes to our understanding about the relations between leadership practices and leaders' decisions on digital tool usage and their corresponding suitability compared with previous ways of performing leadership practices in a non-home office context. Previous studies have outlined the use of digital tools as linked to organizational culture and digital readiness (e.g., Cortellazzo et al., 2019). Our study supplements these findings by revealing that remote leader working in decentralized or more agile organizations feel much more confident in using digital tools for task-oriented leadership practices, since they have often used digital tools for task management before. Moreover, research about leading virtual teams states that virtual leaders "need to be able to choose the right communication tool" (Cortellazzo et al., 2019, p. 14) and outlines the "importance of virtual leaders establishing media through which virtual teams can most effectively communicate and collaborate" (Hambley et al., 2007, p. 17). We find that leaders working from home use a variety of digital tools but often feel uncomfortable with choosing the most suitable tool or combination of tools. Hambley and colleagues' (2007) findings about the suitability of managing more complex situations using synchronous communication are

supplemented by our findings about the suitability of synchronous communication tools, especially for communicating changes when leading from home. Previous studies have acknowledged the increased complexity of leading virtual teams due to the lack of face-to-face communication (e.g., Purvanova & Bono, 2009). These findings are supplemented by our study's results, which reveal the suitability and particular use of video conferences to replace face-to-face communication when leading from home. In providing insights on the suitability of digital tools for remote leadership, we contribute to the scarce literature on leadership and technology.

Third, our paper contributes to research on effective leadership in a challenging and unpredictable context. Our study highlights several drivers of and barriers to leadership effectiveness while leaders try to cope with crisis-specific challenges. For each of the four meta-categories of leadership practices, our findings reveal which factors should be particularly considered for leadership effectiveness when leading from home during the COVID-19 pandemic. Previous research has declared a set of guidelines for virtual meetings as a critical success factor (White, 2014). This is supplemented by our findings that introducing conference rules and sharing digital notes contribute to effective leadership. Moreover, research about virtual leadership describes the lack of physical interaction as one of the main disadvantages of remote leadership (Bell & Kozlowski, 2002). However, our findings indicate personal interaction via video conferences as a motivator for employees and a contributor to effective leadership. Our study also explores the barriers. Recent research findings have revealed that during a lockdown, professional creativity does not increase, whereas everyday creativity significantly increases (Mercier et al., 2021). Concerning creativity in the professional environment, our findings indicate limited support of digital tools for creative and collaborative work. This can be a barrier to the meta-category "solve problems collaboratively and monitor team progress" (e.g., virtual brainstorming with employees). In general, the drivers and the barriers across all digital tools indicate that leaders' decision about which digital tool to use should be well considered. Research on virtual leadership states that less complex leadership practices "often require minimal communication"; in this case, asynchronous communication (e.g., via e-mail

or messenger/chat) would be sufficient (Bell & Kozlowski, 2002, p. 24). Conversely, for more complex practices (e.g., support and feedback), leaders might choose video conferences in combination with screensharing.

In sum, the diaries demonstrate that leaders experiment a lot with the use of digital tools, contributing to a broad range of leadership practices; sometimes, leaders even have to use work-around solutions. These findings can be explained by the sudden change to a remote work environment without being prepared or trained as leaders and employees; employees had to “quickly adjust to remote work environments” (Carnevale & Hatak, 2020, p. 183).

Managerial implications

Due to our detailed findings about the variety of remote leadership practices and the usage and suitability of digital tools, our study leads to specific suggestions for organizations and leaders to improve leadership effectiveness while working remotely during the COVID-19 pandemic. The study set-up, related to the critical incident technique with questions concerning leaders' highlights and lowlights, allows us to provide a broad range of managerial implications. In total, we present six recommendations derived from the diaries, which we structure into task-oriented and relation-oriented leadership practices.

We first summarize three managerial implications related to task-oriented leadership practices. First, team commitment to standard tools for “solve problems collaboratively and monitoring team progress” (Mehtab et al., 2017; Zigurs, 2003), such as Jira for task management, Slack for informal alignments, and e-mail for documentation of meetings, can contribute to effectiveness and efficiency. Remote leaders should motivate their team members to jointly determine these standard tools and to regularly check whether these still fit (according to the organization's data protection rules). However, leaders and team members must have the flexibility to choose digital tools according to their tasks and needs (Mehtab et al., 2017). Another potential benefit of committing to use standard tools is reducing negative emotions while using digital tools, such as feeling observed or controlled as a form of invasion of privacy. Hence, in regular one-on-one meetings, remote leaders should proactively discuss with their team members how each one feels about the usage of digital tools when working from home. Moreover, to avoid employees' neg-

ative emotions, remote leaders should enhance their own “sensitivity to prevent misunderstandings and promote clarity in writing” when using digital tools (Zimmermann et al., 2008, p. 331).

Second, we recommend that leaders be aware that the more tools they use within the team, the more complex the daily set-up will be. To avoid too much fragmentation, effective leaders should better choose fewer digital tools with more functionalities (e.g., MS Teams for videoconferences, calls without video, individual chat, group chat). The use of digital tools during the COVID-19 pandemic requires a high learning curve for leaders, while promising much potential for a huge workplace transformation (Carnevale & Hatak, 2020; Larson & DeChurch, 2020).

Third, in line with White (2014), we recommend that leaders smartly organize their daily calendars (e.g., including enough breaks and alternating between seatwork and meetings), while keeping in mind that constant use of digital tools is tiring. Effective leaders should also save extra time in their calendars for meeting preparation and follow-up (White, 2014). Remote meetings need more preparation time to be efficient. Besides smartly structuring their own work days, leaders should proactively structure their employees’ work days, for example, by starting each day with a stand-up meeting, where each team member talks about one’s daily objectives. In this way, leaders would enable their employees to monitor their own performance (Hunsaker & Hunsaker, 2008), which would contribute to leadership effectiveness, as well as more transparency about the team’s work progress.

We now present the next three managerial implications regarding relation-oriented leadership practices. Fourth, remote leadership should particularly support effective communication instead of control. Communicating effectively could be achieved by defining clear communication guidelines within the team and ensuring that everyone follows them (e.g., whether video is optional). Over-communication is especially recommended to build trust in change processes (Holton, 2001; Hunsaker & Hunsaker, 2008).

Fifth, to make their teams feel supported, effective leaders should take an active role in facilitating a meeting, engage their teams and encourage everyone to participate and contribute (Malhotra et al., 2007). Thereby, effective leaders can ensure the smooth flow of the meeting and the inclusion of everyone’s input. To facilitate an effective meeting, leaders are advised to set up

and distribute a clear agenda in advance. During the meeting, leaders should play the moderator's role, ask questions, and guide the attendees through the agenda.

Sixth, to improve socializing and teambuilding, effective leaders should make sure to set up virtual coffee breaks or team lunches and give their teams room for chatting about non-work-related topics. Sometimes, small gestures, such as using the start of a meeting for social relationship building (Malhotra et al., 2007), can have a significant beneficial impact on employees' mood and commitment.

Limitations and future research

While our in-depth analysis of 155 qualitative diaries has allowed us to gain deep insights into the daily challenges that leaders face during COVID-19, some limitations of this paper should be addressed in future research. First, the results are based on leaders who have mainly office jobs (e.g., financial services) and are thereby able to work remotely. According to Bauwens et al. (2021), context matters when determining trends in leadership research. Existing research mainly focuses on sectoral contexts, such as public healthcare or education, where COVID-19 has a huge impact on daily work (Bauwens et al., 2021); other sectors are so far underexplored. Our study sample covers a range of less explored sectors, such as financial services, law, real estate or automotive, which have high economic relevance. The sample's focus on financial services (48%) might lead to a potential sector bias, which should be reduced in further studies. However, Willemse et al. (2020) reveal that during the pandemic, even financial service companies and their leaders are challenged to work in less hierarchical and more collaborative virtual teams, which is one indicator of a minimized sector bias. To conclude, our study results are likely to be transferable to other industries and their leaders as well since COVID-19 has accelerated the digital transformation of different sectors (Iansiti & Richards, 2020). However, future research could concentrate on a larger sample from a broader range of industries (e.g., including blue-collar jobs) and explore the impacts of the COVID-19 pandemic on leading their respective employees. Moreover, it would be interesting to investigate companies that have not previously used many digital tools for task management, so

the pandemic has caused a huge change of their daily routines when working from home.

Second, the voluntary participation in the diary study means a high self-selection of the participants, since diary studies require a high commitment level over several days. Since our study participants are leaders, who typically have little spare time, their high commitment has been especially required. Thus, researchers could consider including employees in future studies to understand how working remotely would affect them as well.

Third, the diaries have encouraged the leaders to reflect on daily situations that they would usually not think about. This could lead to a reporting of experiences that might be, to some extent, shaped by the participants (Poppleton et al., 2008). However, this limitation is not exclusive to the qualitative diary method but also exists in interviews or questionnaires (Poppleton et al., 2008). Our recommendation for future research would be to use an ethnographic research design, such as participant observation (Ejimabo, 2015), to avoid these limitations, although we are aware of the challenges associated with such a research design. In sum, future research could continue exploring leading from home during a crisis. Especially, leadership in collaboration with digital tools opens an extensive research field. It could be interesting to explore the work environment after the global COVID-19 crisis to understand how the use of digital tools would affect the new normal.

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5. General Discussion

5.1 Theoretical Implications

From both a scientific and practical perspective, the human side of digital transformation is considered a highly relevant field of interest. However, so far, research in the context of digital transformation and the COVID-19 pandemic is limited. Using a conceptual, quantitative, and qualitative research approach, this thesis deepens our understanding about the high impact of technologies, digital transformation, and digital tools on employees and leaders. This thesis structures the main questions around role clarity, practices, skills, and effectivity when working in a VUCA environment. The aim of this work is to not only consider technology as driver of digital transformation, but even more so understanding the key role of people who drive digital transformation and make technology work.

This thesis offers several theoretical contributions to the scarce literature on the human side of digital transformation. Thereby, it contributes to research in the areas of (crisis-induced) digital transformation, digital technologies and COVID-19, and its impact on employees and leaders in five primary ways.

First, this thesis contributes to a more comprehensive understanding about the human side of digital transformation. Previous research focuses mainly on the technical side of digital transformation, such as in strategic IS research defined as “digital transformation as a process where digital technologies create disruptions triggering strategic responses [...]” (Vial et al., 2019) or on the organizational side of digital transformation, such as the creation of a chief digital officer (CDO) role (Horlacher et al., 2016). However, this study outlines the relevance of the human side of digital transformation and its impact on employees and leaders. This research supports and expands upon the previous finding that “people are the real key to digital transformation” as they are the ones making it work (Kane, 2019). New technologies are changing required employee skills since they must collaborate with technology to generate a high-quality service outcome (Chapter 2). Moreover, new technologies are changing leadership roles in technology-driven business environments. Leaders must be able to switch flexibly between the roles as digital pioneers, innovators or digital mentees to handle the emerging leadership challenges in

digital transformation (Chapter 3). Also, when leading from home during the COVID-19 pandemic, leaders must be able to choose the right digital tools to support their leadership practices to lead effectively in distance (Chapter 4). In sum, this study shows how digital transformation and digital technologies impact humans and how they interact.

Second, this thesis contributes to a more detailed understanding about the complexities of working in a VUCA environment (Bennett and Lemoine, 2014), such as digital transformation or the COVID-19 pandemic. Previous research already depicts the trade-offs, paradoxes, and contradictions which can exist within organizations and their leaders in form of the CVF (Quinn, 1988; Quinn & Rohrbaugh, 1981). This study transfers previous research on the CVF to the context of digital transformation and demonstrates the broad behavioral complexity required by leaders (Chapter 3). For employees and leaders acting in a VUCA world, a broad repertoire of relation- as well as task-oriented skills (Chapter 2), roles (Chapter 2 and 3) and practices (Chapter 4) are required to situationally react to disruptive challenges. Relation-oriented skills involve social skills for FLSE, whereas task-oriented skills include more technical skills (Hennig-Thurau, 2004; Peterson et al., 2001) (Chapter 2). However, research reveals that the prioritized FLSE skills will be the “softer” intuitive and empathic social skills, since AI is taking over more and more of the analytical tasks (Huang & Rust, 2018). In the DLF, relation-oriented leadership roles cover the role of the mentor, whereas task-oriented leadership roles include the role of the manager (Chapter 3). Finally, in the COVID-19 context, relation-oriented leadership practices involve team-oriented practices, whereas more operational leadership practices are described as task-oriented leadership practices (Yukl, 2012) (Chapter 4). All in all, this study demonstrates the complexities for humans working in the context of a (crisis-induced) digital transformation and the importance of relation- and task-orientation of employees and leaders to handle these diverse challenges.

Besides the more overarching contributions to the human side of digital transformation and the VUCA environment, there are some more specific contributions to highlight. Third, this thesis expands on research on employees' and leaders' changing roles due to digital transformation (Chapters 2 and 3). This research also contributes to previous research about the service encounter 2.0 (Bowen, 2016; Larivière et al., 2017) and leadership studies including

the CVF roles (Belasen & Frank, 2008; Lawrence et al., 2009) by transferring it to the context of digital transformation. Based on the CVF and several qualitative and quantitative studies, this thesis contributes to leadership research by developing a Digital Transformation Leadership Framework (Chapter 3). On the one hand, the results reveal that both employees and leaders demonstrate roles as innovators and enablers in the context of digital transformation. Hence, this study adds to previous research outlining that “human capital remains a non-substitutional source of innovation and creativity” (Bowen, 2016). Moreover, the enabler role is important for employees empowering customers and technology to perform in the service encounter (Bowen 2016), as well as for leaders to enable their employees in trying out new ideas and creating a culture of learning (Chapter 3). On the other hand, the study results reveal more leader-specific roles (e.g., mentor, digital pioneer) that are not covered within the employees’ roles. To summarize, this thesis contributes to a deeper understanding about changing employee and leader roles in the context of digital transformation.

Fourth, this thesis contributes to research about employees’ skills in the service encounter (Chapter 2). Thereby, this study expands on research concerning frontline service technologies (De Keyser et al., 2019), and changing employees’ roles and skills in service interactions (Bowen 2016; Larivière et al., 2017). Based on these two concepts, this research paper makes an important contribution by synthesizing the archetypes and employee roles and, consequently, developing a frontline service employee skill-based framework (Peterson et al., 2001; Hennig-Thurau, 2004). Thereby this paper contributes to the current service literature on service encounters and technology infusion, since there is little existing research on synthesizing human-augmented service encounter archetypes and service employee roles and skills. This study focuses on employees’ skills, thus contributing to research by Larivière et al. (2017) who identified the specific employee skills related to the identified roles as one main future research direction. Knowledge of employee skills is crucial to perform well and develop effective trainings practices (Larivière et al., 2017). The conceptual synthesis developed in this thesis provides a valuable source for future research in the field of employee skills in the light of digital transformation. For example, the developed skill-based framework for frontline service

employees can be used as a foundation for future research on customer resistance against the changing of service encounters as well as how to operate as an employee (Larivière et al., 2017).

Lastly, this thesis contributes to the scarce literature on the use of digital tools to effectively perform leadership practices while leading from home during a global pandemic (Chapter 4). To date, limited research exists regarding virtual leadership challenges during a pandemic crisis, and the broad repertoire of leadership practices as well as the effective usage of digital tools while leading from home are particularly underexplored. This study expands existing research results, stating that digital tools mainly contribute to planning and monitoring activities (Cortellazzo et al., 2019). Previous findings are supplemented by this thesis' results, which reveal the suitability of video conferences to replace face-to-face communication when leading from home (e.g., Purvanova and Bono, 2009). Moreover, this thesis highlights several drivers and barriers that have positive and negative impacts on leadership effectiveness while leaders try to handle crisis-specific challenges. For example, previous research findings indicate guidelines for virtual meetings as a critical success factor (White, 2014). These results are supplemented by this thesis' findings about meeting guidelines as a driver for effective leadership. This study's results reveal that conference rules and sharing digital notes especially contribute to effective leadership.

5.2 Managerial Implications

This thesis presents valuable insights for organizations, employees, and leaders who are operating in a VUCA environment (Bennett and Lemoine, 2014), including digital transformation and the COVID-19 pandemic.

First, the findings of this thesis reveal the complexities and changes of working in a VUCA environment (Chapter 2, 3, and 4). Digital transformation has tremendously changed the way people work and was additionally rapidly accelerated by the COVID-19 pandemic which required even more virtual collaboration with the aid of digital tools. The extensive use of new technologies is changing the roles of employees and leaders as well as the required skillset. The results of this thesis demonstrate a strong requirement for leaders and

employees to reflect on the changing environment and be open to experimentation. Besides self-reflection, organizations should support employees and leaders during the change process of learning new skills. Specific training sessions according to the individual skill levels are helpful to improve existing skills and learn new ones. Moreover, specific leadership development programs help leaders to keep up with the current technical developments and network within their peer group.

In the following, more detailed managerial implications are presented regarding training and employee and leader development. Second, organizations which consider the implementation of new technologies could use the classification scheme presented in Chapter 2 to differentiate between the different technological archetypes in terms of augmentation or substitution of employees. Moreover, they could include the skill-based framework into their decisions in order to build on existing employee skills. For example, social skills are the principal skills required at the archetype *technology-assisted FLSE (and customer) encounter*, such as at the airline check-in. In case of remote control of IT systems – a *technology-substituted FLSE encounter* – technical skills are required as principal skills. Building on existing employee skills is important, since organizations seem to struggle hiring and training service employees for roles in the technology-infused service encounter (Bowen, 2016). In terms of training and employee development, the developed skill-based framework supports managers in identifying the training need of their employees. Implementing a specific archetype or transitioning from one archetype to another, impacts employees as well as their required skills (Keyser et al., 2019). Cross-functional skills and the FLSEs flexibility to switch between skill types to adapt situationally is beneficial for innovations in a fast-changing environment (Barile et al., 2015).

Third, the DTLF (Chapter 3) could be used as a foundation for leadership development programs. All seven digital leadership roles are relevant in the context of digital transformation. Hence, it is important for leaders to have the ability to exhibit all seven roles, understand them, embody them properly, and be able to switch between roles. Previous studies revealed that leaders who can perform different roles achieve higher leadership effectiveness (Tong & Arvey, 2015). For this reason, it is important for effective leaders to know their weaknesses in order to reduce them through individual or group training

sessions. Organizations should support their leaders' ability to flexible switch between the seven roles. For example, role plays provide space to leaders to experiment and apply the digital leadership roles. Leaders aiming to develop and empower their employees should perform the roles of enablers and mentors, whereas leaders aiming to identify needs for change and driving change should perform the roles of digital pioneers and innovators.

Besides leadership training, the final managerial implication focusses on leadership effectiveness while leading from home. Fourth, our detailed findings on the variety of remote leadership practices and the usage and suitability of digital tools (Chapter 4) lead to specific suggestions for organizations and leaders to improve leadership effectiveness while working remotely during the COVID-19 pandemic. One important factor to improve leadership effectiveness is commitment within the team on standard tools for internal communication (Mehtab et al., 2017; Zigurs, 2003). Another recommendation for leaders is to avoid too much fragmentation between the tools. Also, leaders should adjust their time management, factoring in that remote meetings require more preparation and need to be shorter in order to be efficient (White, 2014). Moreover, remote leaders should focus on over-communication instead of controlling their employees to be effective. By taking over an active role in facilitating meetings, leaders can ensure that everyone's opinion is included. Lastly, leaders should prioritize time for socializing, including virtual coffee breaks. In sum, when leading from home, leaders should be aware of the specifics and should consider the described implications to improve leadership effectiveness while working remotely.

5.3 Limitations and Further Research Directions

The findings of this thesis are subject to some limitations, which in turn offer opportunities for future research.

First, in addition to the conceptual approach on the transformed service employee roles presented in Chapter 2, an empirical study should be conducted. Further research could consider conducting an exploratory study in the form of qualitative interviews (Breidbach & Maglio, 2016). Moreover, further research regarding the impact of new technologies on employee roles in the technology-based service encounter is needed. Future research could explore

insights on how organizations support their employees during the transformation process of gaining new skills (besides training). It may be helpful to collect diary data from service employees to explore their daily experiences and challenges when collaborating with new technologies as well as how their skills evolve over time. To extend the findings with insights into other industries aside from services would be valuable to understand the employee perspective more comprehensively. It could be interesting to apply the classification into the technology-augmented manufacturing (non-service) environment.

Second, the DLF developed in Chapter 3 does not consider the influence of situational contingencies on the relationships between the digital leadership roles and outcome variables. However, Porter and McLaughlin (2006) highlighted the relevance of the organizational context for situational contingency. Hence, future researchers might analyze the relationship between the digital transformation leadership roles and different forms of organizations and leadership situations. In terms of outcome variables, further research might consider additional outcome variables, such as objective performance variables to further confirm the validity of the measure. Finally, future research might pay increased attention to potential endogeneity bias (Shockley et al., 2016) in using further controls for common-method variance (Antonakis & House, 2014). To reveal any changes in leadership behavior over time and to further validate the leadership scale, future research might conduct longitudinal study designs as well as additional replication studies.

Third, the results presented in Chapter 4 are based on leaders who mainly work in office jobs (e.g., financial services, law, media). Future research could use a larger sample including a broader range of industries (e.g., education) to understand how COVID-19 has impacted their daily work routines (e.g., virtual teaching). Further, to avoid the high self-selection of participated leaders due to the required high commitment for daily diary studies, researchers could consider including employees in future studies, particularly those who might have more time to participate over longer time periods. Diary studies with employees working from home during COVID-19 could focus on their experiences of suddenly having to work in virtual teams (e.g., motivation, belongingness) and their extensive use of digital tools (e.g., techno-stress). Moreover, future research could use an ethnographic research design, such as participant observation (Ejimabo, 2015), to avoid limitations including diary

reports which might be shaped by leaders and not proactively used to reflect their experiences on a daily basis.

Fourth, working in the VUCA world, using digital tools opens an extensive research field. It could be interesting to further explore the new normal which we expect after the COVID-19 pandemic. This thesis analyzes only leaders working from home, however hybrid teams where some employees are working from home and some in the office will be a common collaboration model in the near future. Further research could analyze how hybrid teams can collaborate effectively, which leadership practices preferably should be performed in person, and which can be conducted virtually as well. Therefore, further research might consider a longitudinal or experimental study design to gain insights into new work setups, collaboration models, and even required office designs. In sum, there is huge potential for future research in this field, considering new work as a holistic concept offering a competitive advantage (Helmold, 2021).

5.4 Conclusion

In sum, this thesis contributes to research on the human side of digital transformation and especially on the changing role of employees and leaders. First, this thesis offers new insights on how new technology is changing employees' roles in the service encounter (Chapter 2). Second, conceptual and empirical insights into leadership roles in technology-driven business environments are presented in form of the Digital Transformation Leadership Framework (Chapter 3). Third, the complexities of remote leadership and the usage of digital tools during the COVID-19 pandemic are uncovered based on data gathered through a qualitative diary study (Chapter 4). Aside from revealing new insights, this thesis presents potential for further research in the field of new work. In public discussions, new work is labelled as a megatrend, covering topics such as health, work-life-blending, and productivity (Zukunftsinstitut GmbH). Therefore, it is highly relevant for organizations to attract, retain, and lead employees (Alznauer, 2021). Future research is encouraged to enhance awareness on the changes in the work environment and its impact on humans in order to analyze pros and cons of new work for employees and leaders and gain valuable knowledge for practice, research, and society as a whole.

6. Appendix

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Appendix 1: Summary of the study participants.

#	Gender (female / male)	Age (in years)	Job Title	Number of Employees	Industry Sector	Company Size (n employees)
1	m	41-50	Digital process manager	8	Automotive manufacturing	>3,500
2	m	41-50	Product manager connected services	12	Automotive manufacturing	>3,500
3	m	51-60	Vice President Corporate Communications	40	Automotive supplier	>3,500
4	m	51-60	Head of Productivity Management	100	Conglomerate (e.g., industrial manufacturing)	>3,500
5	m	21-30	Research & Development	5	Conglomerate (e.g., industrial manufacturing)	>3,500
6	m	31-40	Digital Office Manager		Construction	501-1,000
7	f	31-40	Innovation Ambassador		Construction	501-1,000
8	m	41-50	Agile Coach	0	Consultancy	<100
9	m	51-60	CEO		Consultancy	<100
10	f	31-40	Lawyer	0	Government & public services	>3,500
11	m	21-30	Art Director	5	Information and communication	501-2,000
12	m	41-50	CEO	80	Information and communication	<100
13	m	31-40	Head of HR	20	Information and communication	>3,500
14	f	21-30	Senior Communications Manager	3	Information and communication	<100
15	m	31-40	Manager	3	Financial services	100-500
16	m	41-50	Senior Manager HR		Plant and machinery construction	>3,500
17	m	>60	Head of Analysis Academy	4	Process automation	>3,500
18	f	31-40	HR Business Partner	0	Process automation	>3,500
19	m	21-30	Consultant	0	Professional services	>3,500
20	m	21-30	IT-consultant	0	Professional services	>3,500

21	m	41-50	Consultant	40	Professional services	2,001-3,500
22	m	31-40	Consultant	6	Professional services	>3,500
23	m	31-40	Consultant	5	Professional services	>3,500
24	m	31-40	Head of IT	40	Professional services	501-2,000
25	m	31-40	IT and Process Manager	15	Professional services	2,001-3,500
26	m	41-50	Senior Manager		Professional services	>3,500
27	m	41-50	Board member	4	Retail	<100
28	m	41-50	Sales manager	4	Technology	2,001-3,500
29	m	51-60	Senior Key Account Manager		Technology management	501-2,000
30	m	51-60	CIO	350	Textile	>3,500

Appendix 2: Researcher and data triangulation.

Researcher and Data Triangulation**Researcher Triangulation**

- 1) Multiple members of the research team reviewed and discussed the coding scheme and abstract categories.
- 2) In assessing the reliability of our findings, an independent judge who was not involved in the data collection used the derived coding plan to code five randomly selected interviews (16.67% of the full sample), which exceeds the 10% threshold to achieve representativeness (Lombard et al., 2002). The interrater-reliability scores were satisfactory.
- 3) Next, three other independent judges to assign the codes to the abstract themes. The interrater-reliability resulted in adequate reliability coefficients.
- 4) The remaining disagreements were discussed and reconciled.

	One independent judge	Three other independent judges	Threshold (Rust & Cooil, 1994)
Percentage of agreement	.82	.88	> .70 (Rust & Cooil, 1994)
Perreault and Leigh's (1989) I_r	.90	.93	> .70 (Rust & Cooil, 1994)
Cohen's (1960) kappa	.81	–	> .70 (Rust & Cooil, 1994)
Fleiss' (1971) kappa	–	.70	> .41 (Fleiss, 1971)

Data Triangulation

We compared our data with related research streams, especially research on leadership behaviors (e.g., Behrendt et al., 2017; Yukl, 2012), and interviewed experts with different backgrounds to attain a holistic view (Corbin & Strauss, 2015).

Appendix 3: Categories, codes, and illustrative quotes.

Category (Role)	Coding (Behavior)	Illustrative Quote
Digital Pioneer	Thinking digitally ahead	"...developing appropriate strategies for digitalization..." (406)
Innovator	Inspiring	"S/he must be able to inspire others with her/his ideas." (285)
	Leading change	"...person, which is able to transform a theoretical approach into a practical application..." (277)
	Stimulating	"...to motivate and inspire own employees or colleagues through my work and my way of doing and seeing things." (249)
Net-worker	Exhibiting external and internal networking activities	"... using especially digital media to connect, communicate and exchange with employees ..." (266)
Enabler	Being team-oriented	"...cooperative leader who works very team focused..." (24)
	Empowering intercultural teamwork	"...has to be able to bring culturally different people together..." (163)
	Empowering interdisciplinary teamwork	"...bringing together different groups into interdisciplinary teams with skills that are necessary to reach the goal..." (117)
	Empowering the team	"...I give decision-making authority to teams and employees." (180)
	Enabling agile working methods	"...the organization becomes more agile; I mean by that to remove rigid working time models; people do not have to sign in at eight o'clock in the morning and sign out at five o'clock in the afternoon – it does not work like that anymore." (39)
	Enabling space	"...letting people do it by themselves, giving the team more space rather than keeping them on a short leash..." (323)
	Promoting non-hierarchical working methods	"...less hierarchical, rather participative oriented." (419)
	Supporting an open error culture	"...it has to be accepted that employees make mistakes. You have to stay calm and relaxed and you have to be aware of the fact that we are trying something new and that does not work out all the time." (57)
	Supporting fast exchange	"...supporting fast exchange." (70)
	Supporting flexible working methods	"...creating new ways of working and work structures..." (227)
Mentor	Coaching	"...coaching. S/he does not give the answers but rather encourages the employees to come up with an idea." (30)
	Communicating openly	"...s/he is openly communicating so that employees gain access to information..." (388)
	Communicating regularly	"...being more communicative than previously..." (368)

	Communicating understandably	"...that s/he communicates well. Thereby, s/he is able to transfer her/his digital knowledge to her/his employees." (408).
	Developing employees	"...they foster digital competencies of their employees." (186)
	Establishing respectful relationships	"...I respect every person I am interacting with equally..." (47)
	Establishing trustful relationships	"...mutual trust, or that trust between her/him and her/his employees will be established." (438)
	Actively giving feedback	"...a behavior which is characterized by constant feedback..." (117)
	Individualizing	"...the ability to get people on board regarding their uniqueness: that is very important." (132)
	Knowing strengths and weaknesses	"...knowing what the employee is good at, what are her/his strengths and her/his weaknesses..." (256)
	Motivating employees	"...motivating employees and getting them to be enthusiastic." (287)
	Providing security to reduce anxiety	"It is important to reduce fear because many employees believe that their job will be rationalized. A great leader will show her/his employees what they can do to reduce this risk." (243)
	Providing sense	"...providing employees the sense of their individual tasks regarding digital transformation..." (81)
	Sharing knowledge	"Someone who likes to share information and knowledge – also digitally..." (254)
	Understanding employees	"...showing interest in the employees: what they are doing, what they are achieving. Showing interest in their thoughts and ideas." (270)
Manager	Being authorized to decide	"...the supervisor is part of a team, of course, s/he has the authority to finally decide." (18)
	Being goal-oriented	"You have to set goals, but they can be broadly expressed, or they can be refined with the team." (105)
	Being task-oriented	"...not determining the goal at the beginning." (393)
	Being transparent	"...everything what s/he is doing and what the team is doing has to be more transparent compared to previous times." (379)
	Coordinating tasks	"...allocate a task to an employee, a time period during which the task has to be done and offer her/him help or the opportunity to ask for help when needed – leave the rest to the employee." (431)
	Tracking tasks	"...s/he is always informed, s/he knows what each employee is doing." (156)

Appendix 4: A comparison between the original roles of the CVF and the Digital Transformation Leadership roles and the concordant behaviors.

Digital Transformation Leadership Roles & Selected Behaviors	CVF Quadrant	CVF Dimensions	Overlap With the Original CVF Roles and Behaviors
Digital Pioneer <i>understands digital trends early; develops an internal digital vision for her/his organization; identifies business opportunities</i>	Identifying needs for change and implementing innovative changes	Task-oriented & external focus	–
Innovator <i>undertakes innovative initiatives to facilitate innovative change; engages in creative problem-solving approaches</i>	Implementing innovative changes	Task-oriented & external focus	Innovator <i>works solution-oriented; comes up with new ideas; inspires others</i>
Networker <i>exchanges necessary information; develops and maintains interdisciplinary networks within and outside the organization</i>	Building and maintaining favorable relationships	Relation-oriented & external focus	Broker <i>relies on creativity and communication skills; negotiates and acquires new resources; has a valuable external network</i>
Enabler <i>sets up the team with interdisciplinary members; creates agile, flexible, and empowering work settings for her/his team members</i>	Developing and empowering human resources	Relation-oriented & external focus	Facilitator <i>encourages participation and team-building</i>
Mentor <i>provides individual support and mentoring</i>	Developing and empowering human resources	Relation-oriented & internal focus	Mentor <i>shows caring and empathic behaviors and aims to develop people</i>
Digital Mentee <i>seeks advice from her/his employees on digital issues</i>	Learning digital skills and managing innovative changes	Relation-oriented & internal focus	–
Manager <i>possesses a strong task and goal orientation</i>	Learning digital skills and managing innovative changes	Task-oriented & internal focus	Monitor <i>provides information, tracks progress, and controls for compliance guidelines</i> Producer <i>produces results; pushes for productivity and task completion</i> Coordinator

Ensures stable workflow processes by bug fixing, scheduling, and coordinating

Director

provides structure; clarifies expectations; sets goals

Appendix 5: Questionnaire items by role (7-point Likert Scale From 1 = *strongly disagree* to 7 = *strongly agree*) with EFA loadings and standardized CFA loadings.

Role	Items	EFA	CFA
Digital Pioneer (DP)	DP_1 As a leader, I understand the drivers of digital transformation.	.95	.83
	DP_2 As a leader, I recognize the opportunities and risks for my organization resulting from the digital transformation.	.90	.80
	DP_3 As a leader, I recognize digital trends at an early stage.	.79	.90
	DP_4 As a leader, I continuously identify needs for change in terms of digital transformation.	.83	.89
	DP_5 As a leader, I create a clear, digital vision for my department.	.62	.83
	DP_6 As a leader, I analyze the impacts of digital transformation on my department.	.67	.77
Innovator (I)	I_1 As a leader, I encourage innovative changes in the organization.	.66	.86
	I_2 As a leader, I implement innovative ideas in the organization.	.75	.89
	I_3 As a leader, I implement innovative ideas in the organization.	.84	.90
	I_4 As a leader, I get organizational members enthusiastic about innovations in the organization.	.84	.82
	I_5 As a leader, I inspire to initiate innovative changes in the organization.	.91	.84
Networker (N)	N_1 As a leader, I actively network with colleagues of my department.	.80	.74
	N_2 As a leader, I network across departmental boundaries with colleagues in other departments.	.83	.76
	N_3 As a leader, I actively network with colleagues outside my organization.	.69	.75
	N_4 As a leader, I actively network to expand my network.	.91	.85
	N_5 As a leader, I actively network to be able to consult a suitable contact for every possible question.	.76	.80
Enabler (E)	E_1 As a leader, I enable non-hierarchical teamwork.	.66	.73
	E_2 As a leader, I create an open space for the team to experiment.	.85	.86
	E_3 As a leader, I enable working in interdisciplinary teams.	.61	.69
	E_4 As a leader, I enable the usage of flexible working methods in the team.	.87	.82
	E_5 As a leader, I create an open error culture in the team.	.50	.74
Mentor (MT)	MT_1 As a leader, I support the individual skill development of my employees.	.62	.79
	MT_2 As a leader, I know the individual strengths and weaknesses of my employees.	.76	.71
	MT_3 As a leader, I act as an individual mentor.	.80	.84

	MT_4 As a leader, I provide individual direct feedback to my employees.	.90	.80
	MT_5 As a leader, I maintain an individual, trusting relationship with each of my employees.	.70	.83
	MT_6 As a leader, I support each of my employees in achieving their individual goals.	.65	.90
Manager (M)	M_1 As a leader, I regularly track task-related work progress in my area of responsibility.	.42	.65
	M_2 As a leader, I evaluate work processes and working methods according to suitable key performance indicators.	.65	.75
	M_3 As a leader, I effectively pre-structure tasks.	.94	.74
	M_4 As a leader, I effectively define key performance indicators for my area of responsibility.	.66	.77
	M_5 As a leader, I always act in a goal-oriented way.	.58	.63
	M_6 As a leader, I effectively coordinate tasks.	.76	.71
Digital Mentee (DM)	DM_1 As a leader, I actively exchange information with my employees to benefit from their digital know-how.	.48	.74
	DM_2 As a leader, I learn from my employees how to use digital tools that I do not know yet.	.90	.84
	DM_3 As a leader, I seek advice from my employees on digital issues.	.99	.81
	DM_4 As a leader, I'm happy to receive feedback from my employees on working with digital methods.	.83	.85
	DM_5 As a leader, I develop my own digital skills through the input of my employees.	.90	.92
	DM_6 As a leader, I also act as a mentee (someone who is mentored by a mentor) to familiarize myself with the role of digitalization in the daily life of my employees.	.70	.76

Notes. n = 263. An EFA was performed with principal component factoring using pro-max rotation ($kappa = 4$). All items loaded highly on the anticipated dimension while showing negligible cross-loadings. Hence, only the factor loadings of indicators on their respective factors from EFA were shown.

Appendix 6: Sample characteristics.

Sample Characteristics	Sample A	Sample B
Sample size (employees)	263	294
Gender: female	56.3%	51.0%
Mean age (in years)	31.84 (SD = 10.11)	33.93 (SD = 12.80)
Average work experience (in years)	9.30 (SD = 11.17)	11.84 (SD = 12.22)
Educational level: university degree	70.4%	58.9%
Average progressiveness regarding the digital world	5.03 (SD = 1.20)	4.92 (SD = 1.14)
Average focus on digital transformation	4.57 (SD = 1.51)	4.77 (SD = 1.39)
Sector: most-cited industry sector	Automotive (15.2%)	Automotive (17.3%)
Organization size: large organizations (more than > 3,500 employees)	36.1%	23.5%

Appendix 7: Descriptive statistics, intercorrelations, reliabilities, and validity.

	M	SD	a.	b.	c.	d.	e.	f.	g.
a. Digital Pioneer	4.32	1.52	.84						
b. Networker	4.92	1.44	.60***	.78					
c. Enabler	5.21	1.32	.63***	.49***	.77				
d. Innovator	4.49	1.48	.78***	.63***	.66***	.87			
e. Mentor	5.03	1.36	.55***	.58***	.77***	.65***	.82		
f. Manager	4.57	1.27	.59***	.56***	.53***	.64***	.68***	.72	
g. Digital Mentee	4.54	1.46	.56***	.49***	.55***	.54***	.60***	.56***	.83
AVE			.70	.61	.60	.75	.67	.52	.69
FR			.93	.89	.70	.94	.92	.86	.93
α			.94	.90	.88	.94	.92	.86	.93

Notes. $n = 263$. AVE = average variance extracted, FR = factor reliability, and α = Cronbach's α . Numbers on the diagonal in italics show the square root of the AVE.

*** $p < .01$.

Appendix 8: CFA Results for the digital transformation leadership scale.

Model ^a	$\chi^2(df)$	$\Delta\chi^2$	Δdf	CFI	SRMR	RMSEA
First-order 7-factor model	1122.94 (664)	–	–	.945	.058	.051
First-order 4-factor model	2278.80 (689)	1155.86** *	25	.808	.128	.094
First-order 1-factor model	3327.681 (696)	2204.74** *	32	.683	.092	.120
Second-order fac- tor model	1322.391 (691)	199.45***	27	.924	.069	.059

Notes. $n = 263$ (Sample A). $\chi^2(df)$ = Chi-square test statistics with corresponding degrees of freedom; CFI = comparative fit index; RMSEA = root-mean-square error of approximation; SRMR = standardized root-mean-square residual. The first-order four-factor model draws on the inter-element relationships between the seven digital transformation leadership roles. Regarding the single-factor model, all items load on one global factor.

^aAll alternative models are compared to the 7-factor model.
*** $p < .01$.

Appendix 9: Predictive validity: results for the subordinate-level outcomes using OLS regression.

	Innovative Job Performance ^b	Knowledge Sharing ^a	Digital Maturity ^b
Intercept	1.78***	4.42***	-1.95***
Gender	-.13**	.11*	.04
Age	.21***	.17***	.05
Progressiveness	.27***	-.02	.17***
DTF	.12**	.06	.20***
Digital Pioneer	-.03	.05	.35***
Networker	-.03	.17**	-.03
Enabler	.13*	.18**	.02
Innovator	.19**	-.34***	.05
Mentor	-.12	-.10	.04
Manager	.02	.13	.15**
Digital Mentee	.10	.20***	-.06
R ²	.27	.16	.36

Notes. ^a $n = 263$ (Sample A), ^b $n = 294$ (Sample B). Gender: 1 = male, 2 = female. DTF = focus on digital transformation. Standard path coefficients.
*** $p < .01$, ** $p < .05$, * $p < .1$.

Appendix 10: Structure of the daily diary – highlight of the day.

Please describe a leadership situation in which the use of digital tools **did support** your desired result. *#highlight*

- (1) Which digital tool(s) did you use?
 - (2) For which leadership practice(s) did you use the mentioned digital tool(s)?
 - (3) What was your motivation/the reason for using the mentioned digital tool(s)?
 - (4) How did you feel while using the mentioned digital tool(s)?
 - (5) How effective was the use of the digital tool(s)? (How well/completely was the corresponding leadership task performed with it? How did the digital tool contribute?)
 - (6) How would you have performed the leadership practice if you had not been working from home? What digital tools would you have used?
 - (7) Do you have any additional remarks?
-

Appendix 11: Structure of the daily diary – lowlight of the day.

Please describe a leadership situation in which the use of digital tools **did not support** your desired result. *#lowlight*

- (1) Which digital tool(s) did you use?
 - (2) For which leadership practice(s) did you use the mentioned digital tool(s)?
 - (3) What was your motivation/the reason for using the mentioned digital tool(s)?
 - (4) How did you feel while using the mentioned digital tool(s)?
 - (5) How (in)effective was the use of the digital tool(s)?
 - (6) How would you have performed the leadership practice if you had not been working from home? What digital tools would you have used?
 - (7) Do you have any additional remarks?
-

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Declarations of Co-Authorship