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THE DIGITAL TRANSFORMATION LEADERSHIP FRAMEWORK: CONCEPTUAL AND EMPIRICAL INSIGHTS INTO LEADERSHIP ROLES IN TECHNOLOGY-DRIVEN BUSINESS ENVIRONMENTS

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The powerful and disruptive changes associated with digital transformation make leadership more complex than before, which results in new and demanding challenges for companies and leaders alike. Thus, building on the competing values framework (CVF), which postulates that leaders must adopt multiple roles and behaviors, the current research aims to identify leadership roles appropriate in digital transformation and subsequently investigate whether the existing CVF roles are still

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relevant. A qualitative study was conducted to identify appropriate leadership behaviors in digital transformation. Additionally, a measurement scale for the identified leadership roles was developed and tested. Furthermore, multidimensional scaling (MDS) was used to test the degree-of-fit between the identified leadership roles in digital transformation and the four CVF quadrants. The results reveal that new leadership roles emerge in the context of digital transformation. Some original CVF roles are still relevant, but others should be modified. Overall, the findings indicate that leaders need a broad behavioral complexity to master the emerging leadership challenges in digital transformation.

Introduction

Organizations and their leaders are facing overwhelming challenges that arise from digital transformation (Hanelt et al., 2020), 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 (Petrucci & Rivera, 2018). 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). The powerful and unsettling changes associated with digital transformation increase leadership complexity while simultaneously require considerable flexibility (Ford et al., 2021). 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 such tensions in organizations and 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 suggested that the underlying assumptions of the approach need to be retested (Belasen & Frank, 2008). Hence, researchers questioned the relevance of the established leadership roles and altered their positions within the CVF (e.g., Vilkinas & Cartan, 2006). Belasen and Frank (2008) revealed that

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

Answering the question is difficult considering that research on leadership in digital transformation is still limited (Cortellazzo et al., 2019). Thus far, research lacks empirical knowledge on which leadership behaviors are appropriate for dealing with the leadership challenges associated with digital transformation. Therefore, Avolio et al. (2014) advised scholars to rethink leadership in times of digital transformation. Thus, one purpose of the current study was to identify leadership roles that appropriately address the leadership challenges digital transformation brings. The second purpose was 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.

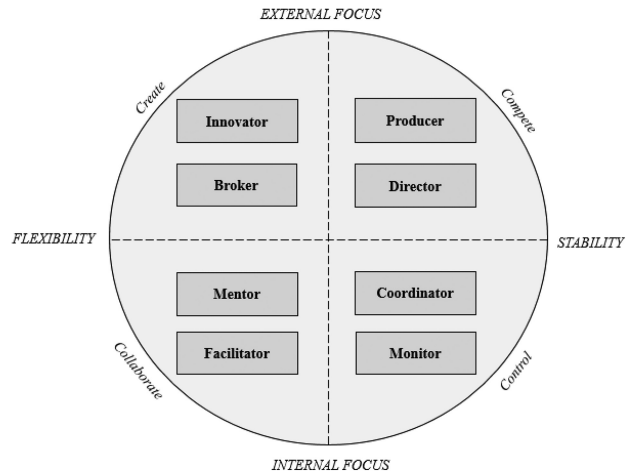
The current research contributes to the leadership literature in several ways. First, the current research extends the leadership literature by identifying leadership roles appropriate to the leadership challenges associated with digital transformation. Second, the current research develops and introduces a measurement scale for the identified leadership roles. To examine the validity of the new scale, a multiple-study approach was used. Third, the current research complements 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,

conclusions about the appropriateness of the CVF in such dynamic, technology-driven business environments were drawn. Thereby, the number and placement of the leadership roles as well as possible configurations of the quadrants in the context of digital transformation were investigated.

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). The 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 (Lawrence et al., 2009). The framework has been used to explain a variety of organizational phenomena, for example, in the fields of organizational culture, leadership, or human resource management (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 (i.e., facilitator, mentor, innovator, broker, monitor, coordinator, producer, and director). These roles are embedded in four quadrants, named Collaborate, Create, Control, and Compete (see Figure 1). 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 highlighted the overall value of the CVF, they called 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;



Note. A 45° rotation was applied.

Figure 1 The Competing Values Framework According to Quinn (1988)

Vilkinas & Cartan, 2006). In the context of digital transformation, skills like innovating, applying situational mindsets, creating conditions that facilitate an organization's digital maturity, and networking become more important to manage disruptive businesses (Lavine, 2014; Lippitt, 2021; Petrucci & Rivera, 2018; Sousa & Rocha, 2019). Hence, some leadership roles of the original CVF might insufficiently meet the organizational challenges accompanied by digital transformation. Thus, 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. Consequently, the current research sought to identify leadership roles that are appropriate in digital transformation and collate them with the original CVF roles.

Developing a Digital Transformation Leadership Framework

STUDY 1: QUALITATIVE STUDY FOR IDENTIFYING APPROPRIATE LEADERSHIP ROLES

A qualitative approach was applied to systematically study which specific leadership behaviors are appropriate to manage the challenges associated with digital transformation. Thirty in-depth interviews with managers and employees were conducted. The

participating managers and employees provided a comprehensive understanding of digital transformation from their experience of developing digital strategies or as members of organizational teams that engage in digital transformation initiatives (e.g., chief information officers, IT consultants, agile coaches), and are thus considered as digital transformation experts. A diverse sample of industries, company sizes, numbers of employees, and age of participants was obtained. The interviewee included 4 females and 26 males, of whom most were between 31 and 40 years old (33.3%). Data saturation was reached at approximately 30 interviews, after which no new information appeared in the data (Guest et al., 2006). The 30 participants were asked the same set of self-developed open-ended questions to ensure that the themes that arose were not just random occurrences (Heyler et al., 2016) and to enable comparison between participants' answers (Williamson & Johanson, 2018). At the beginning of every one-on-one interview, the participants were provided with a short illustrative summary of circumstances changing due to digital transformation to ensure a consistent understanding of the context. Next, participants shared 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. The data were reviewed with a thematic analysis, an iterative approach for identifying, analyzing, and reporting themes and categories within the data in rich detail (Braun & Clarke, 2006); thereby specifically following the thematic analysis steps outlined by Braun and Clarke (2006). To ensure the trustworthiness of the findings, both researcher and data triangulation was applied (Bluhm et al., 2011). All reliability thresholds were met.

The qualitative study disclosed multiple leadership behaviors, which were clustered based on shared content-related similarities (Nowell et al., 2017). Throughout the process, abstract categories that represent distinct leadership roles were developed. Based on the responses, six different leadership roles were identified, 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. 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 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, nonhierarchical, 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, allowing 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, such leaders 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, suggesting that they can be embedded in an overarching framework, the *digital transformation leadership framework*, and can be labeled as *digital transformation leadership roles*.

CONCEPTUALIZING THE DIGITAL TRANSFORMATION LEADERSHIP FRAMEWORK

Inter-Relationships between the Roles

Explicating how the digital transformation leadership roles interact is important to disclose how the constructs relate to one another (Behrendt et al., 2017). 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 the 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 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). Hence, the digital transformation leadership roles were conceptually compared with the CVF and its roles. The manager role overlaps with the four CVF roles monitor, producer, director, and coordinator. The finding is broadly in line with Vilkinas and Cartan (2001), who also formed the producer, director, and coordinator into one role, named the deliverer, which is characterized by its goal achievement orientation. Additionally, Denison et al. (1995) found a strong overlap between the 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.

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. Consequently, combining existing leadership behaviors with new leadership behaviors is necessary to successfully manage the challenges arising from digital transformation. Therefore, 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, a leader might not exhibit all digital transformation leadership roles simultaneously. It is more likely that a leader will exhibit the digital transformation leadership roles in

varying degrees, depending on the particular leadership situation. The assumption 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).

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, an extensive scale development process was conducted based on Crawford and Kelder's (2019) scale development recommendations for leadership constructs. The scale development process contained three phases: item development, test of content validity, and empirical evaluation (see Table 1).

STUDY 2: ITEM DEVELOPMENT

To develop rigorous items and item descriptions, the items were grounded in the literature (MacKenzie et al., 2011), face validity checks were conducted (DeVellis, 2016), and the research team was separated by including external experts who performed a "classification from above" (Hinkin, 1995). The digital transformation leadership items were generated based on (a) their conceptualizations, (b) relevant literature concerning various leadership measurements (e.g., questionnaire items of the CVF developed by Denison et al., 1995), and (c) the results of 30 in-depth interviews with digital transformation experts. Importantly, items for each of the six digital transformation leadership roles were generated separately. Furthermore, each construct is modeled as having reflective indicators, resulting in an initial set of 42 items.

STUDY 3: TEST OF CONTENT VALIDITY

To assess the content validity of the initial item set (Hinkin, 1995), a classifying study was conducted (Liden & Maslyn, 1998), and 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). The deductive classifying study was an iterative two-round survey process in which independent experts assessed the items

to avoid researcher bias (Crawford & Kelder, 2019). The participants were asked to place each randomly ordered item into one of the six digital transformation leadership roles. Additionally, a free text field allowed the participants to add further digital transformation leadership roles to ensure all relevant digital transformation leadership roles were captured. Hence, the experts could recommend to drop, change, or add items and clarify ones marked as unclear (Liden & Maslyn, 1998). The 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 the experts' feedback, a seventh leadership role emerged. By following 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, the *digital mentee* role was created. Leaders as digital mentees seek advice from their employees on digital issues and refine their digital skills through the employees' input. Moreover, the digital mentee role is characterized by actively exchanging information with employees to benefit from their digital know-how. Consequently, such leaders learn from their employees how to use digital tools that they do not know yet. Six items pertaining to the digital mentee were developed based on the participants' statements and relevant literature (e.g., Anderson et al., 2017; Petrucci & Rivera, 2018).

The interrater reliability measures showed acceptable rater agreement values (see Table 1). Only items that achieved a minimum of 80% accuracy in the digital transformation experts' classification were included to the initial item set (Hinkin, 1995). In addition, 11 items that had achieved the threshold, but of which experts recommended changes to capture each digital transformation leadership role more accurately, were refined. 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 Table A1). Additionally, employees may rate the leadership behaviors of their leaders. Therefore, the items could be

Table 1 Overview of the Empirical Studies

Empirical Studies	Sample and Method	Results
Study 1: Identification of appropriate leadership roles	<i>Qualitative study</i> based on 30 in-depth interviews with digital transformation experts	<ul style="list-style-type: none"> Six categories of different leadership roles and behaviors
Study 2: Item generation	<i>Item generation study</i> based on the results of the qualitative study and literature on related leadership approaches (e.g., questionnaire items of the CVF developed by Denison et al., 1995).	<ul style="list-style-type: none"> Achieving face validity Six digital transformation leadership roles Initial item set: 42 items
Study 3: Test of content validity	<i>Classifying study</i> (Hinkin, 1995) <ul style="list-style-type: none"> Sample size: $n = 42$ digital transformation experts from 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 & Leigh's [1989] I; Round 1: .87, Round 2: .85; Fleiss' [1971] kappa: Round 1: .63, Round 2: .58) Seven digital transformation leadership roles
Study 4: Empirical evaluation	<i>Study to test the construct and discriminant validity</i> <ul style="list-style-type: none"> Sample size: $n = 263$ employees Explorative factor analysis (EFA) Cronbach's alpha Confirmatory factor analysis (CFA) <i>Study to test the predictive validity</i> <ul style="list-style-type: none"> Sample size: $n = 263$ employees (Sample A); $n = 294$ employees (Sample B) Ordinary least square (OLS) regression 	<ul style="list-style-type: none"> EFA: Seven factors (explained 67.56% of the total variance); see Table A1. Significant standardized factor loadings (range .63 to .92, $p < .01$); see Table A1. CFA results: Satisfactory fit ($\chi^2 = 1,122.941$; $df = 664$; $p < .001$; RMSEA = .051; SRMR = .058; CFI = .945). Intercorrelations of all seven digital transformation leadership roles were acceptable (ranging from .49 to .78, $p < .01$); see Table A3. All factor reliability (FR) values, the Cronbach's alpha values, and the average variance extracted (AVE) scores exceeded the recommended thresholds (Bagozzi & Yi, 1988; Nunnally, 1978); see Table A3. All seven constructs met Fornell and Larcker's (1981) criterion for discriminant validity; see Table A3. Results show evidence supporting the predictive validity of the scale measuring the digital transformation leadership roles; see Table A4.
Study 5: Spatial arrangement of the digital transformation leadership roles	<i>MDS study</i> to test the degree-of-fit between the identified leadership roles in digital transformation and the four CVF quadrants <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

Notes. RMSEA = root-mean-square-error of approximation; SRMR = standardized root mean square residual; CFI = comparative fit index. Percentage of agreement comprises the average agreement across all items.

rephrased to allow employees to provide perceptions of their leaders.

STUDY 4: EMPIRICAL EVALUATION

To assess the reliability and validity of the survey items, a comprehensive empirical evaluation process was conducted (see Table 1), including scale evaluation and test

of predictive validity (Wright et al., 2017). Data from two independent samples of German employees were collected. The participating employees have experience with digital transformation in the workplace, ensuring that they can answer the questions properly. Table A2 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, an explorative factor analysis of the theoretically derived digital transformation leadership framework was performed 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, a confirmatory factor analysis (CFA) was performed using maximum likelihood (ML) estimation. The CFA results gave a satisfactory fit ($\chi^2 = 1,122.941$; $df = 664$; $p < .001$; RMSEA = .051; SRMR = .058; CFI = .945). All 39 items showed significant standardized factor loadings (range .63–.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). Furthermore, 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 (see Table A3).

Second, to determine the impact the seven digital transformation leadership roles have in view of digital transformation as a disruptive change process, three different outcome variables that are considered relevant in the context of organizational transformation were chosen (i.e., innovative job performance, knowledge sharing, and digital maturity), using Samples 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, 2001). 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) revealed 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). Hence, the identified digital transformation leadership roles might 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. Bartol et al.'s (2009) eight-item scale was used to measure employees' knowledge sharing ($\alpha = .89$; sample item: "I actively seek helpful information to share with the group"). Digital maturity was assessed 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." The employees then rated their organizations against the ideal on a scale from 1 to 10. Gender and age of the participants, and additionally the participant's progressiveness about the digital world and the average frequency with which they dealt with digital transformation were selected as control variables, suspecting them to be related to either the independent or the dependent variables.

The results (see Table A4) show that employees who perceived their leaders as enablers ($b = .13$, $p < .1$) and innovators ($b = .19$, $p < .05$) indicated higher levels of innovative job performance. Employees who perceived their leaders as networkers ($b = .17$, $p < .05$), enablers ($b = .18$, $p < .05$), and digital mentees ($b = .20$, $p < .01$) reported higher levels of knowledge sharing. Leaders who were perceived as innovators ($b = -.34$, $p < .01$) had a negative impact on employees' knowledge sharing. Further, organizations' digital maturity was significantly affected by leaders who were perceived as digital pioneers ($b = .35$, $p < .01$) and managers ($b = .15$, $p < .05$).

Summarizing, the results provide evidence for the scale's construct, discriminant, and criterion validity (see Table 1).

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), another study with 165 leaders (Study 5) was conducted. Due to the companies' data protection policies, only information on the leaders' hierarchical level was collected. In terms of the hierarchical level, the majority of the leaders (67.88%) headed a business unit. The seven digital transformation leadership roles were measured 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 multidimensional scaling (MDS) as a visualization technique, mean scores were calculated for each of the seven digital transformation leadership roles (Vilkinas & Cartan, 2006). Based on the mean scores, the MDS was conducted using SPSS PROXSCAL. The results of the MDS indicated 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 showed 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 mentoring (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 or the COVID-19 pandemic require organizations and leaders to act solely in a flexible way (Bennett & Lemoine, 2014; Fernandez & Shaw, 2020). Instead, the results indicated 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), thus likewise in the context of digital transformation. In the current research context, 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). Discovering the digital mentee role as a task-oriented leadership role is surprising. 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). Leaders exchanging with employees as means to an end to improve their own digital skills helps leaders as digital mentees to accomplish an objective. Therefore, the digital mentee is likely task-oriented rather than relation-oriented. The relation-focused quadrants contain the mentor, the enabler, and the networker. When performing the roles of an enabler, 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 2) of the digital transformation leadership roles demonstrates the assumed realignment of the roles appropriate for facing digital transformation.

Discussion

The current article contributes to leadership research in at least three important ways. First, the findings provide insight into leadership roles and behaviors specifically

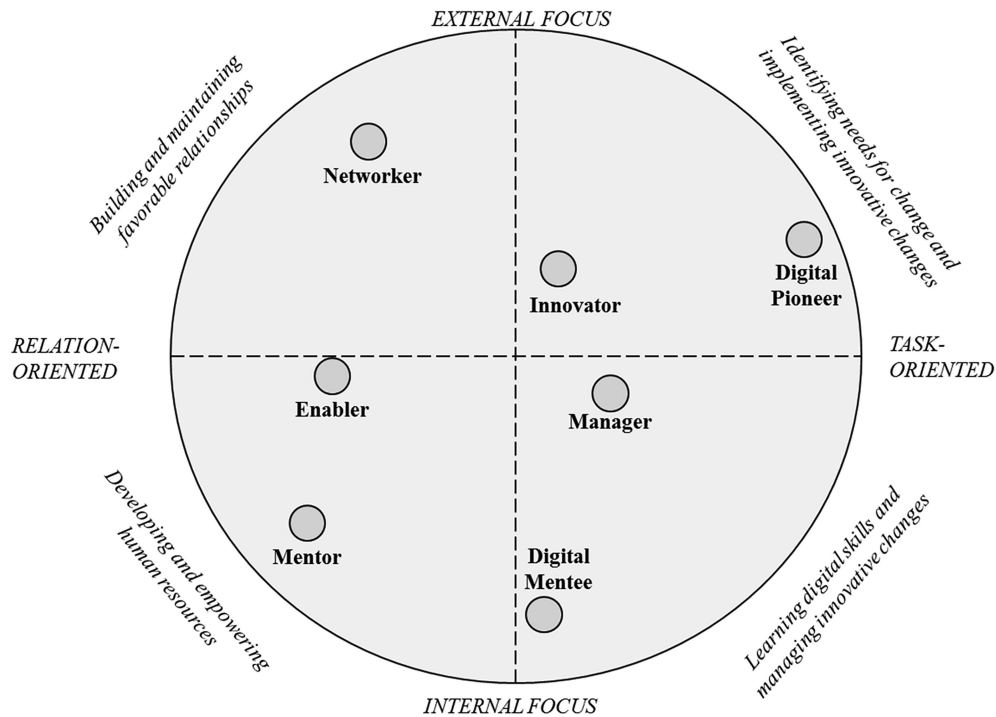


Figure 2 Digital Transformation Leadership Framework with Its Seven Roles

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, the innovator could have a dark side, pointing to a “double-edged sword pattern” (Diebig et al., 2016). The results showed 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. The 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, the findings 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, a new measure, which fulfills all reliability and validity thresholds, was introduced to the leadership literature. Researchers might apply the developed measurement scale in further studies concerning leadership in the digital era.

Third, the current research extends 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 such an increasingly important business environment. The 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). Additionally, 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, the findings 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, the dimension was redefined with a task-relation orientation, which is considered important for the implementation of change processes (Battilana et al., 2010). In line with Vilkinas and Caran's (2001) modification of a CVF dimension, the task-relation orientation perfectly fits the change processes induced by digital transformation. Since almost every industry is affected by a dynamic business environment (Schoemaker et al., 2018), the advanced CVF model applies to many different industries, which indicates its generalizability. Thus, the model might be of special interest for further leadership research in the context of digital transformation.

PRACTICAL IMPLICATIONS

The results indicated important managerial implications for leadership development. Organizational actions should help leaders to develop (a) the ability to exhibit all seven digital transformation leadership roles, (b) an understanding of the roles to deploy them properly, and (c) the ability 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).

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, organizations should 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 indicated 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 to particularly 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; thus, enhancing leaders' adaptivity (Wilson et al., 2020). A useful starting point could be role plays, either virtual or in-person, in which different leadership situations are simulated.

LIMITATIONS AND FURTHER RESEARCH

Several limitations of the current research point to suggestions for future research. First, it would be beneficial to gain knowledge on the influence of situational contingencies on the digital transformation leadership roles. Therefore, further research should investigate which specific leadership situations demand which leadership role(s). 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 the current research intended to minimize possible common method biases through different techniques—for example, by guaranteeing participants' anonymity and psychologically separating the title predictor and the criterion variables (Podsakoff et al., 2003)—the estimates could still be biased. Therefore, future research could use 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 the current research is based on several empirical studies, complementary tests and replication studies are required to further validate the digital transformation leadership scale.

Conclusion

Based on the current findings, combining new roles with more traditional roles is key to successfully mastering digital transformation. Future research is encouraged to use the developed framework as a basis to advance the understanding of leadership in the digital era. Furthermore, the current research might inspire leaders to reflect on their leadership behavior and supports them by showing the value of adopting different leadership roles in such an important but turbulent business environment like digital transformation.

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Appendix

Table A1 Questionnaire Items by Role (7-point Likert Scale from 1 = Strongly Disagree to 7 = Strongly Agree) with Explorative Factor Analysis (EFA) Loadings and Standardized Confirmatory Factor Analysis (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 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 impact 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 get organizational members enthusiastic about innovations in the organization.	.84	.90
	I_4 As a leader, I use creative problem-solving methods to encourage innovation 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 nonhierarchical 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

Table A1 (Continued)

Role	Items	EFA	CFA
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 am 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 promax 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.

Table A2 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:	36.1%	23.5%
large organizations (more than >3,500 employees)		

Table A3 Descriptive Statistics, Intercorrelations, Reliabilities, and Validity

	<i>M</i>	<i>SD</i>	<i>a.</i>	<i>b.</i>	<i>c.</i>	<i>d.</i>	<i>e.</i>	<i>f.</i>	<i>g.</i>
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.

*** $p < .01$.

Table A4 Predictive Validity: Results for the Subordinate-Level Outcomes Using Ordinary Least Square 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. Gender: 1 = male, 2 = female. DTF = focus on digital transformation. Unstandardized path coefficients.

^a $n = 263$ (Sample A).

^b $n = 294$ (Sample B).

* $p < .1$,

** $p < .05$,

*** $p < .01$.