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LEADING IN THE DIGITAL AGE: A SYSTEMATIC REVIEW ON LEADER TRAITS IN THE CONTEXT OF E-LEADERSHIP

Research Paper

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Abstract

Due to the rapid changes in work environments caused by the Covid-19 pandemic, leadership has shifted from face-to-face to virtual contexts. Accordingly, the new challenges require specific e-leader traits. To summarize the divergent scholarly discussion, we conducted a systematic review and identified distal (i.e., personality, cognitive abilities, motives and attitudes, and core beliefs) and proximal (i.e., skills) attributes of e-leaders. Our results show that some traditional leader traits such as technological, communication, motivational, and organizational skills are also important for e-leadership. However, certain traits become increasingly important in virtual contexts: e-leaders need adaptability and risk-taking to deal with constant change, and higher cultural, social, and emotional intelligence to foster collaboration in diversified teams. In addition, digital technologies require particular change management, coaching, and trust-building skills. Our findings contribute to the current discussion on e-leadership and help practitioners train their leaders towards the identified e-leader profile.

Keywords: e-Leadership, Digital Leadership, Virtual Leadership, Leadership 4.0, Leader Traits

1 Introduction

The decision of many governments to enforce so-called "lockdowns" during the Covid-19 pandemic forced millions of people to use digital work tools such as collaboration platforms and video conferencing tools and to work 100% remotely (Richter, 2020). Accordingly, many organizations needed to reconfigure work with the introduction of home-based work practices (Contreras et al., 2020). In this way, the pandemic served as a burning glass for uncovering numerous challenges associated with telecommuting, such as work-home interference due to intensification of work (Andrade and Petiz Lousã, 2021; Buomprisco et al., 2021; B. Wang et al., 2021) and difficulties in managing physically separated employees (Buomprisco et al., 2021) due to inefficient communication (Neufeld et al., 2010; Park and Cho, 2020; B. Wang et al., 2021) and the risk of social isolation of the individual (Adamovic, 2022; Buomprisco et al., 2021). Since the imposed changes in the nature of work are expected to continue after the pandemic, leaders and followers are called to overcome these challenges and adapt in the long term (Contreras et al., 2020).

As a result of the pandemic, many leaders suddenly and without preparation became so-called "e-leaders" (Chamakiotis et al., 2021; Contreras et al., 2020). Put simply, leadership is a contextual and goal-influencing process between leaders and their followers, groups of followers, or organizations, determined in particular by the leaders' characteristics and behavior (Antonakis et al., 2004). Leaders in the context of e-leadership, i.e., e-leaders, additionally use digital technologies to collaborate and communicate with their followers independently of place and time in so-called virtual contexts (VanWart, Roman, and Pierce, 2016). The goal is to positively influence the feelings, attitudes, thinking, performance, and behavior of their followers and to lead them effectively through the use of these technologies (Roman et al., 2019). Therefore, e-leaders are in need of specific leader traits (including personality characteristics, cognitive abilities, motives, and competencies (Zaccaro, 2007)) that determine leadership behavior and consequently influence the effectiveness of e-leadership (DeRue et al., 2011). However, leader traits known from traditional leadership cannot be simply transferred to the e-leadership setting (Cortellazzo et al., 2019; Lu et al., 2014), as e-leadership implies specific challenges for leaders. In particular, these include ensuring employee motivation with the associated difficulties of an effective (verbal) communication and knowledge transfer, effective relationship and trust building, effective performance management and effective employee development (e.g., training) in the context of the geographical and temporal distance between leaders and followers and the associated use of a technologically mediated environment (Contreras et al., 2020; Machado and Brandão, 2019). Therefore, e-leadership also requires unique competencies (Maduka et al., 2018), such as the ability to communicate appropriately through digital technologies to enable successful social interaction; the ability to build teams and to develop trust by using these technologies as well as the ability to demonstrate technology-related expertise (Roman et al., 2019).

Although there is a growing body of academic contributions on leader traits for e-leadership, current studies remain fragmented and vary in application contexts, methods, and content focus (e.g., focus exclusively on either competencies or personality characteristics). Only a synthesis of these fragmented views from different disciplines leads to a holistic representation of the current state of research and thus contributes to a comprehensive understanding of relevant e-leader traits. The few existing reviews focus on either e-leadership in general (Chamakiotis et al., 2021; Contreras et al., 2020), competencies and skills (Byrd, 2019; Cortellazzo et al., 2019) or personality characteristics (Klein, 2020), but do not capture the diversity of leader traits required for e-leadership. To address this research gap, this work aims to *identify and analyze which leader traits for e-leadership have been debated in the academic literature*. Furthermore, the identified e-leader traits are discussed in relation to leader traits relevant to traditional leadership in order to analyze their similarities and differences with respect to the particular challenges of e-leadership. With this synthesis, this paper provides an important contribution to the research field of e-leadership for scholars as well as practitioners and decision makers in the fields of information systems, information management, human resource management, and general management who are interested in understanding how an e-leader profile should be designed for leading dispersed followers remotely through the use of technology, while opening avenues for future scientific discussion. From a practical perspective, it presents companies, and especially human resource management, with a comprehensive e-leader trait profile based on current research that can be used to recruit and develop e-leaders. It also supports e-leaders in addressing the challenges associated with e-leadership and the pandemic.

2　Background

2.1　The Influence of Leader Traits on Leadership Effectiveness

Leadership effectiveness describes the leader's success in influencing followers to achieve the organizational goals, and is often considered the basis for organizational performance and growth (Amagoh, 2009). Therefore, extensive research efforts have been made to examine how leadership effectiveness is influenced by the leader as an individual. Research on the factors that influence leadership effectiveness can be broadly divided into two paradigms that have evolved as two streams in

the search for an explanation of leadership effectiveness (DeRue et al., 2011): Studies applying the *leader trait paradigm* consider personality, personal characteristics and competencies as important dispositional determinants of leadership effectiveness, whereas studies applying the *leader behavior paradigm* emphasize the role of leadership behaviors as situational determinants of leadership effectiveness (DeRue et al., 2011). However, meta-analytic reviews of these paradigms suggest a combined and sequential influence of these two determinants: Personality, characteristics, and competencies influence situational behavior, which in turn drives leadership outcomes (Dinh and Lord, 2012; Zaccaro et al., 2018).

The foundation of the *leader trait paradigm*, which focuses on these innate dispositions as antecedents of behavior, is Thomas Carlyle's Great Man Theory (Carlyle, 1840). The theory states that leaders are individuals endowed with special characteristics and heroic abilities (Judge et al., 2009; Meuser et al., 2016). Leader traits refer to the qualities that distinguish followers from leaders (Zaccaro, 2007) and can be defined "[...] as relatively coherent and integrated patterns of personal characteristics that reflect a range of individual differences and promote consistent leadership effectiveness across a variety of group and organizational situations [...]" (Zaccaro, 2007). For example, the Big Five personality characteristics (McCrae and Costa, 1987) have been shown to impact leadership effectiveness (Hoffman et al., 2011; Zaccaro et al., 2018). So-called 'Dark triad' constructs such as narcissism, dominance and machiavellianism associated with personality (Paulhus and Williams, 2002) also impact both subjective and objective leadership effectiveness (Judge et al., 2009). In addition, cognitive abilities such as intelligence (Amagoh, 2009) and emotional intelligence (Dinh and Lord, 2012), individual motives and values (Zaccaro et al., 2018), as well as self-confidence, honesty, charisma, creativity and flexibility (Kirkpatrick and Locke, 2011) have been identified as relevant leader traits. Beyond these inheritable qualities, contemporary definitions of leader traits also include state-like characteristics that refer primarily to the leader's skills and competencies, which can be learned and do not constitute predispositions (Hoffman et al., 2011). For example, social skills, problem-solving skills, and expertise (Zaccaro, 2007) as well as communication skills and political skills (DeRue et al., 2011) represent interindividual differences that extend beyond personality. These state-like characteristics such as competencies are assumed to be more closely related to leader behavior than personality and cognitive abilities such as intelligence, which is why the two categories can be referred to as *proximal attributes* and *distal attributes* of leader traits (Judge et al., 2009; Zaccaro, 2007).

2.2 Research on Leader Traits in e-Leadership

E-leadership can be defined as "[...] a set of *technology-mediated* social influence processes aimed at changing attitudes, feelings, thinking, behavior, and performance" (Roman et al., 2019). When discussing about e-leadership, scholars tend to use several, similar terms such as "digital leadership" (Antonopoulou et al., 2021; Roman et al., 2019), "virtual leadership" (DasGupta, 2011) or "leadership 4.0" (Oberer and Erkollar, 2018). In the broadest sense, these concepts can be understood as leadership using technology without the geographic separation of leader and followers, for example through the effective promotion and integration of technological learning and technological literacy, such as the use of smartboards within school environments (Preston et al., 2015). However, we understand e-leadership in this review in a narrower sense as the use of technology to lead *geographically dispersed* followers, with the leadership process mediated by the Internet (Avolio and Kahai, 2003), which we call e-leadership in virtual contexts. There are different virtual contexts such as "virtual teams" (Avolio, Sosik, et al., 2014; Torre and Sarti, 2020), "telework" (Contreras et al., 2020; VanWart, Roman, X. H. Wang, et al., 2019), "remote work" (Byrd, 2019; Contreras et al., 2020), or "home-based work" (Contreras et al., 2020), which are often not clearly distinguished in studies about e-leadership. However, their main commonalities, which can be seen as crucial to the e-leadership paradigm, are a certain spatial and temporal dispersion of teams and the fact that leaders may never physically meet one or more of their followers (Avolio, Kahai, and Dodge, 2000; DasGupta, 2011). Because information technologies can be used for different levels of virtual interaction, i.e., one-to-one and one-to-many interactions (Avolio, Kahai, and Dodge, 2000), they have a significant impact on leadership processes (Avolio, Sosik, et al.,

2014), such that traditional leadership approaches cannot be readily applied to e-leadership (Cortellazzo et al., 2019; Oberer and Erkollar, 2018).

As the lack of face-to-face interactions with followers in virtual contexts challenges leaders and current leadership paradigms (Dittes et al., 2019), leader traits required for successful e-leadership effectiveness are likely to differ in virtual contexts (Cortellazzo et al., 2019; Lu et al., 2014). For example, recent studies suggest that the influence of extraversion on effective leadership is not present (Ruiller et al., 2019; Wilson et al., 2021). Rather, e-leadership requires unique leadership competencies (Maduka et al., 2018) and skills (Eggers and Hollmann, 2018; Zeike et al., 2019). Diverse studies emphasize the importance of particular e-communication skills (Cascio and Montealegre, 2016; Zimmermann et al., 2008). For example, an e-leader should be able to effectively use available information technologies by combining synchronous and asynchronous tools in a balanced manner (Cascio, 2000). One of the most comprehensive classifications of e-leadership competencies are the six e-competencies according to Liu et al. (2018) and VanWart, Roman, X. H. Wang, et al. (2019), which includes the following skills: e-communication, e-social, e-team building, e-change management, e-technological and e-trustworthiness. In general, these six competencies are skills that are particularly relevant for leading in electronic settings. For example, the e-communication skill is about the clarity of communication in electronic settings. This means that communication via tools has to be very clear and well organised with opportunities for employees to give feedback to avoid errors and untested assumptions (VanWart, Roman, X. H. Wang, et al., 2019). In general, leader traits are assumed to have a greater impact on leadership effectiveness in the context of e-leadership than in traditional leadership (Eggers and Hollmann, 2018). For example, Kayworth and Leidner observed a strong relationship between e-leadership effectiveness and the leader's abilities to act as a mentor, provide role clarity, and communicate effectively and satisfactorily from the follower's perspective (Kayworth and Leidner, 2002). However, research in e-leadership is still rather scattered across different disciplines and remains fragmented (Cortellazzo et al., 2019; Schwarzmüller et al., 2018), especially in terms of leader traits for e-leadership (Roman et al., 2019). To address this gap, this study aims to synthesize and summarize the fragmented literature on leader traits for e-leadership with the goal of providing a comprehensive overview of the required traits of an e-leader.

3 Research Method

To synthesize the fragmented literature on leader traits in virtual contexts from different application contexts (e.g., business, public sector, etc.) and in particular the multitude of studies from the field of education, we chose to conduct a systematic literature review following Snyder's methodological suggestions (Snyder, 2019). Systematic reviews are able to provide a methodical, replicable, and transparent survey of complex fields of literature on topics such as e-leadership (Siddaway et al., 2019). A systematic review allows for aggregating findings from fragmented fields (Snyder, 2019), and thus represents an appropriate choice to answer our primary research question: *What leader traits for e-leadership have been discussed in the academic literature?*

To identify pertinent literature, three scholarly databases were searched (Web of Science, EBSCO Host, and SpringerLink). We selected these multidisciplinary databases as they index a wide range of peer-reviewed journals and conference proceedings in the management and information systems domain. In order to gather all relevant literature on e-leadership traits, we also included search terms related to akin concepts in scholarly literature (Antonopoulou et al., 2021; DasGupta, 2011; Oberer and Erkollar, 2018; Roman et al., 2019), including "digital leader*", "virtual leader*" and "leader* 4.0", as elaborated in the previous section. Similarly, we included several terms related to leader traits in their contemporary definition, such as "characteristic*", "competenc*" and "skill*". Authors 1 and 2 agreed on these search terms on the basis of definitions of leader traits in a preliminary set of relevant literature concerned with leader traits (DeRue et al., 2011; Hoffman et al., 2011; Zaccaro, 2007). Hence, the search was conducted in July 2021 using the following search term: TITLE-ABS-KEY(("e-Leader*" OR "virtual leader*" OR "digital leader*" OR "leader* 4.0") AND ("competenc*" OR "skill*" OR "characteristic*" OR "trait*")).

In the case of SpringerLink, using "leader* 4.0" in the query yielded too many irrelevant results related to Industry 4.0 with no specific reference to leadership, thus we added "leader 4.0" and "leadership 4.0" as separate search terms. As a language criterion, only English-language articles were retained. To ensure sufficient research quality, only studies from peer-reviewed journal articles and conference proceedings were included in the final sample. In terms of content, only articles that focused on personality traits, skills, competencies, or characteristics of leaders, thus conforming to the definition of leader traits (DeRue et al., 2011; Hoffman et al., 2011; Zaccaro, 2007) were considered, excluding other articles retrieved with the search terms that related to digital transformation in general, enterprise capabilities for digital leadership, virtual team skills, robotics, or e-internships. Because we wanted to obtain a reliable overview of which leadership traits have been identified as relevant in independent academic studies, we excluded articles that merely referenced an existing classification by other authors rather than contributing new findings, as the inclusion of these articles would have biased our results toward frequently (self-)cited classifications. Figure 1 illustrates the results of the search strategy and screening process. Altogether, 30 articles were included in the final review.
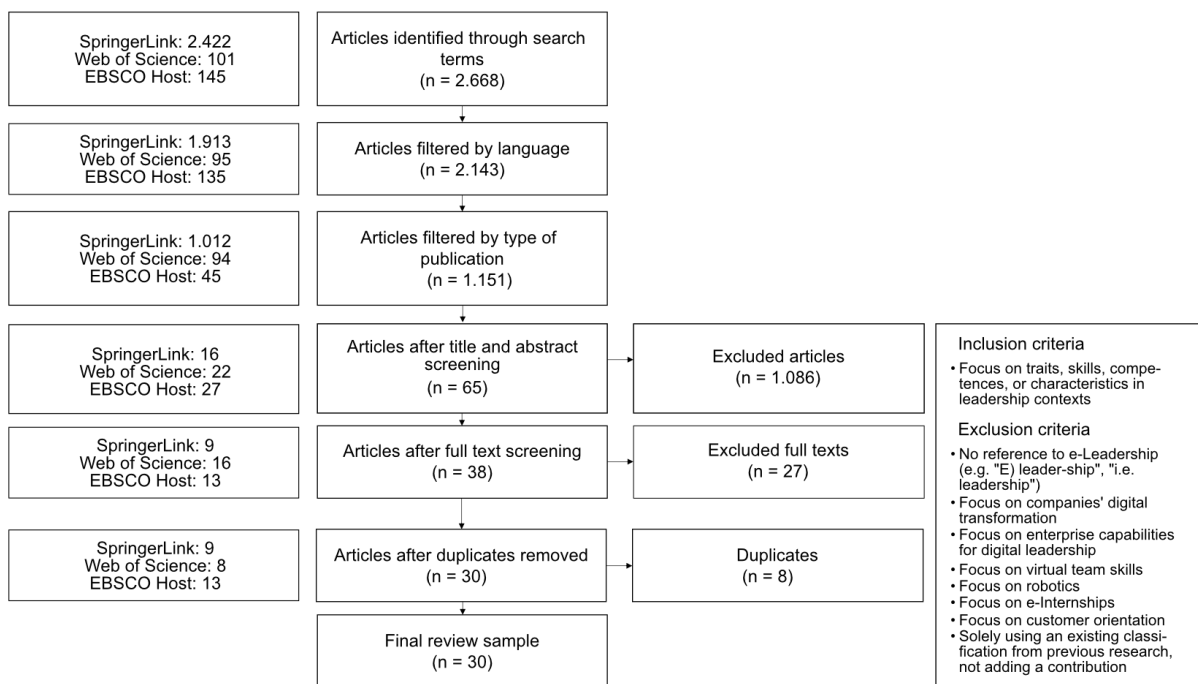

Figure 1.   Flow diagram of the systematic review process.

Metadata such as title, year, authors and publication name of the records were extracted using Citavi and manually verified upon import. Following the suggestions of Webster and Watson (Webster and Watson, 2002), author-centric qualitative data extraction included coding the research method and context of the study as well as the e-leader traits mentioned in the paper. E-Leader traits were initially coded inductively according to the general inductive data analysis approach (Thomas, 2006). For example, one article mentioned cultural intelligence, resilience, optimism, and trust-building skills (Maduka et al., 2018), and we coded these traits separately to identify all e-leader traits related to our research question. The initial inductive coding was performed by author 1. Author 2 then reviewed the inductive coding performed by author 1, whereby contradictory codes were resolved in a detailed contentual discussion. Subsequently, both authors developed inductive categories of codes together. In the following concept-centric phase, the inductively coded traits were analyzed and deductively classified into *distal* and *proximal* attributes, consistent with distinctions made by research on leadership traits in traditional leadership (Hoffman et al., 2011; Zaccaro et al., 2018). As explained before, distal attributes are inheritable dispositions described as "more universal precursors for the growth and development of more [...] proximal personal characteristics" (Zaccaro, 2007). In contrast, proximal

attributes represent state-like skills as "precursors to leadership processes that, in turn, predict leadership outcomes" (Zaccaro, 2007). This means that proximal attributes are more closely related to leadership outcomes, including leadership effectiveness, than distal attributes.

4 Results

In our review, we find that scholarly interest in e-leader traits has increased in recent years, with most studies (16 of 30) published since 2019 (see Table 3 and Figure 2 for an overview). 21 of the 30 articles examine e-leader traits in a business context, six in an educational context, two in a public sector context, and one in a nursing context. In terms of research methods, eight studies used case study-based qualitative approaches, three studies applied quantitative surveys, three studies adopted a mixed methods approach, and two studies conducted qualitative interviews. In addition, we identified four literature reviews that included either a review of e-leaders' skills or characteristics, and ten articles that were conceptual in nature. Consistent with previous research on leader traits in traditional leadership (Hoffman et al., 2011; Zaccaro, 2007; Zaccaro et al., 2018), we identified both distal and proximal attributes of e-leaders that were deemed important for e-leadership effectiveness. Inductive coding revealed a variety of distal attributes (see Table 1) and nine different skill sets as proximal attributes (see Table 2). In the following, we describe the identified leader traits for e-leadership in detail.
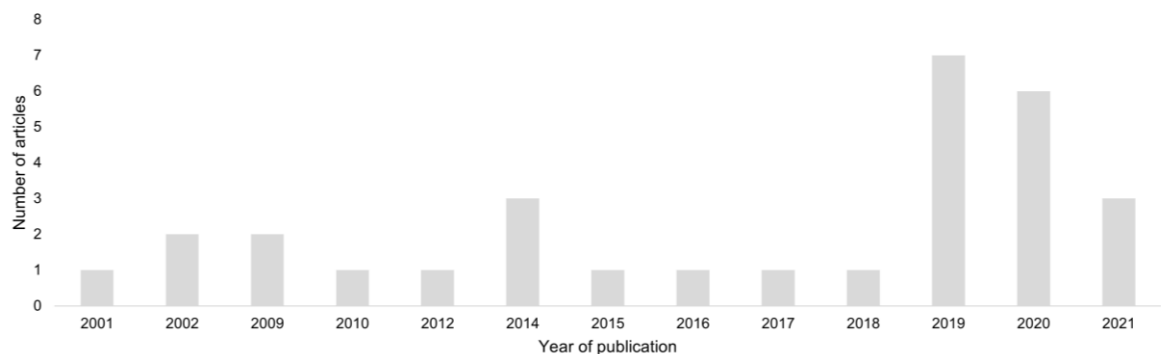

Figure 2. *Histogram of the number of analyzed articles and their year of publication.*

4.1 Distal Attributes of an e-Leader

Distal attributes describe leader traits such as personal dispositions and cognitive abilities that are relatively independent of situational influences and provide the foundation for the emergence and growth of proximal attributes (Hoffman et al., 2011). In accordance with classifications from traditional leadership theory (Zaccaro et al., 2018), we identify distal attributes of e-leaders in the dimensions of *personality*, *cognitive abilities*, *motives and attitudes* and *core beliefs* (listed in Table 1).

Personality. *Adaptability*, sometimes referred to as flexibility (Klus and Müller, 2021; VanWart, Roman, X. H. Wang, et al., 2017), as a personal disposition to respond quickly to constant changes in the dynamic virtual environments (Klein, 2020), was highlighted in our review as the most critical e-leader personality trait. In addition to adaptability, the perpetual shifts of virtual contexts often require rapid decision making under ambiguity, so e-leaders should bring a high degree of *ambiguity tolerance* (Cortellazzo et al., 2019; Shah and Patki, 2020; Wargin and Dobiéy, 2001) to deal with continually changing conditions. In addition, e-leaders must be *courageous* and *risk affine* to fulfill their leadership duties in dynamic virtual settings. In this context, it has been emphasized that e-leaders must demonstrate a sufficient level of *decisiveness* (Cortellazzo et al., 2019; Klein, 2020) and, once they have made a decision, use their *assertiveness*, *persuasiveness*, and *perseverance* to enforce their choice in the face of criticism. Dealing with the adversities of digital technology also requires e-leaders to be *resilient*, i.e., to keep moving forward after failures (Maduka et al., 2018), and to remain *calm* under pressure (Klus and Müller, 2021). On the other hand, the virtual environment requires *openness* to embrace new

Distal attributes	No.	Sources
Personality		
Adaptability	5	Klein, 2020; Klus and Müller, 2021; Kuscu and Arslan, 2016; Shah and Patki, 2020; VanWart, Roman, X. H. Wang, et al., 2017
Visionary	5	García, 2015; Klein, 2020; Kuscu and Arslan, 2016; Leeuwen, 2002; Mohammad, 2009
Risk propensity	4	Cortellazzo et al., 2019; Shah and Patki, 2020; Torre and Sarti, 2020; Wargin and Dobiéy, 2001
Openness	4	Klus and Müller, 2021; Norman et al., 2020; Savolainen, 2014; Vrana and Singh, 2021
Assertiveness	4	Klein, 2020; Klus and Müller, 2021; Maduka et al., 2018; Savolainen, 2014
Ambiguity tolerance	3	Cortellazzo et al., 2019; Shah and Patki, 2020; Wargin and Dobiéy, 2001
Courage	2	Klein, 2020; Klus and Müller, 2021
Resilience	2	Klein, 2020; Maduka et al., 2018
Curiosity	2	Klein, 2020; Shah and Patki, 2020
Decisiveness	2	Cortellazzo et al., 2019; Klein, 2020
Persuasiveness	2	Klein, 2020; Kuscu and Arslan, 2016
Perseverance	1	Klein, 2020
Calmness	1	Klus and Müller, 2021
Charisma	1	García, 2015
Cognitive abilities		
Cultural intelligence	5	Cortellazzo et al., 2019; Gierlich-Joas et al., 2020; Klein, 2020; Maduka et al., 2018; Roy, 2012
Emotional intelligence	5	Alas, 2002; Alward and Phelps, 2019; Cortellazzo et al., 2019; Klus and Müller, 2021; Savolainen, 2014
Creativity	4	Cortellazzo et al., 2019; Klein, 2020; Klus and Müller, 2021; Orte and Diño, 2019
Social intelligence	3	Cortellazzo et al., 2019; Klein, 2020; Maduka et al., 2018
General intelligence	2	Norman et al., 2020; Purvanova et al., 2021
Analytical ability	2	Klein, 2020; VanWart, Roman, X. H. Wang, et al., 2017
Motives and attitudes		
Willingness for life-long learning	6	Cortellazzo et al., 2019; Klein, 2020; Klus and Müller, 2021; Mohammad, 2009; Shah and Patki, 2020; VanWart, Roman, X. H. Wang, et al., 2017
Entrepreneurial orientation	3	Cortellazzo et al., 2019; Klein, 2020; Shah and Patki, 2020
Willingness to assume responsibility	3	Mohammad, 2009; VanWart, Roman, X. H. Wang, et al., 2017; Wargin and Dobiéy, 2001
Experimental mindset	2	Leeuwen, 2002; Mohammad, 2009
Achievement orientation	1	VanWart, Roman, X. H. Wang, et al., 2017
Enthusiasm for digitization	1	Klein, 2020
Core beliefs		
Self-confidence	3	Klus and Müller, 2021; Roy, 2012; Shah and Patki, 2020
Honesty	3	Mohammad, 2009; Norman et al., 2020; Savolainen, 2014
Optimism	2	Maduka et al., 2018; Roy, 2012
Integrity	2	Norman et al., 2020; Savolainen, 2014
Leadership self-efficacy	1	Maduka et al., 2018
Reliability	1	Maduka et al., 2018

Table 1.   Distal attributes for e-leadership identified by the systematic review.

technologies and experiences (Klus and Müller, 2021; Norman et al., 2020; Vrana and Singh, 2021) and to show trustworthiness (Savolainen, 2014). E-leaders should have an innate *curiosity* and a genuine thirst for knowledge and drive digital transformation in companies with their *visionary* nature. Furthermore, *charisma*, which depends on personal qualities and the power of personality is important in both face-to-face and e-leadership contexts. However, charisma cannot be easily transferred through mediation technologies. Therefore, transferring charisma in virtual contexts requires processes such as routinisation, which include rituals, ceremonies or other cultural forms (García, 2015).

Cognitive abilities. As virtual collaboration tends to spread to increasingly diverse teams with different cultural backgrounds, research has highlighted the importance of e-leaders' *cultural intelligence*, especially to avoid misinterpretation and miscommunication in virtual channels (Maduka et al., 2018; Roy, 2012). Similarly, recognizing the emotional state of followers despite the obstacles of digital technology requires a high level of *emotional intelligence* as a prerequisite to understand the perspective of employees and consider it in managing the path to the goal (Cortellazzo et al., 2019; Klus and Müller, 2021). *Social intelligence* as a related cognitive ability refers to the ability of e-leaders to comprehend and anticipate team dynamics and interactions in virtual collaboration (Cortellazzo et al., 2019; Klein, 2020; Maduka et al., 2018). *General intelligence*, although less important than cultural, emotional, and social intelligence, still supports effective e-leadership (Norman et al., 2020; Purvanova et al., 2021), and *analytical ability* helps e-leaders evaluate various strategic and technological options in decision making (Klein, 2020; VanWart, Roman, X. H. Wang, et al., 2017). Finally, *creativity* has been stressed as one of the most important cognitive abilities for e-leaders Creative thinking enables e-leaders to meet the organizational challenges of virtual environments with innovative solutions, thereby driving organizational improvements (Klein, 2020; Orte and Diño, 2019).

Motives and attitudes. Several studies underline the importance of e-leaders' *willingness to engage in lifelong learning* in order to stay up-to-date on the latest technologies and trends (Cortellazzo et al., 2019; Klein, 2020; Klus and Müller, 2021). In this way, e-leaders are able to continuously improve themselves and the digital processes in organizations (Shah and Patki, 2020). In addition, e-leaders must have a certain level of *entrepreneurial orientation* or an *experimental mindset* in order to translate their digital visions into innovative business models and processes (Klein, 2020). Finally, *achievement orientation* (VanWart, Roman, X. H. Wang, et al., 2017) with the corresponding *willingness to assume responsibility* (Mohammad, 2009; VanWart, Roman, X. H. Wang, et al., 2017; Wargin and Dobiéy, 2001) together with *enthusiasm for digitization* and digital technologies (Klein, 2020) drives e-leadership effectiveness.

Core beliefs. In addition to personality, cognitive abilities, and motives and attitudes, individual studies point to the core beliefs of leaders that influence the effectiveness of e-leadership. In particular, e-leaders need to be *self-confident* and believe in their own ability to lead the virtual team, i.e., *leadership self-efficacy* (Maduka et al., 2018), which, in contrast to self-confidence, refers to a more situational belief in one's ability to accomplish a particular task (Bandura, 1982). Flexible and realistic *optimism* helps e-leaders in the face of difficulties (Maduka et al., 2018; Roy, 2012). From a follower perspective, it is also important that e-leaders demonstrate *honesty*, *integrity* and *reliability* as prerequisites for trustworthy relationships in virtual contexts (Norman et al., 2020; VanWart, Roman, X. H. Wang, et al., 2017).

4.2   Proximal Attributes of an e-Leader

In contrast to the relatively stable distal attributes, proximal attributes describe leader traits that are more situational and precede leadership behavior (Zaccaro, 2007). Proximal attributes do not represent dispositions but mostly refer to skills that can be trained and learned (Hoffman et al., 2011). In our review, we identify nine different skill sets pertinent to e-leadership effectiveness: communication skills, technological skills, motivational skills, trust-building skills, organizational skills, coaching skills, decision making skills, change management skills and networking skills (see Table 2).

Proximal attributes	No.	Sources
Communication skills	23	Alas, 2002; Alward and Phelps, 2019; Byrd, 2019; Cortellazzo et al., 2019; García, 2015; Kerfoot, 2010; Klein, 2020; Klus and Müller, 2021; Kuscu and Arslan, 2016; Leeuwen, 2002; Loucks and Ozogul, 2020; Maduka et al., 2018; Mohammad, 2009; Norman et al., 2020; Panteli et al., 2019; Passey, 2014; Purvanova et al., 2021; Roy, 2012; Ruiller et al., 2019; Savolainen, 2014; Torre and Sarti, 2020; VanWart, Roman, X. H. Wang, et al., 2019; Ziek and Smulowitz, 2014
Technological skills	22	Alas, 2002; Alward and Phelps, 2019; Byrd, 2019; Cortellazzo et al., 2019; Gierlich-Joas et al., 2020; Kerfoot, 2010; Klein, 2020; Klus and Müller, 2021; Kuscu and Arslan, 2016; Lanvin and Kralik, 2009; Maduka et al., 2018; Mohammad, 2009; Norman et al., 2020; Orte and Diño, 2019; Passey, 2014; Roy, 2012; Savolainen, 2014; Shah and Patki, 2020; Torre and Sarti, 2020; VanWart, Roman, X. H. Wang, et al., 2017, 2019; Vrana and Singh, 2021
Motivational skills	18	Alward and Phelps, 2019; Byrd, 2019; García, 2015; Kerfoot, 2010; Klein, 2020; Klus and Müller, 2021; Kuscu and Arslan, 2016; Loucks and Ozogul, 2020; Maduka et al., 2018; Orte and Diño, 2019; Panteli et al., 2019; Roy, 2012; Ruiller et al., 2019; Shah and Patki, 2020; Torre and Sarti, 2020; VanWart, Roman, X. H. Wang, et al., 2019; Wargin and Dobiéy, 2001; Ziek and Smulowitz, 2014
Trust-building skills	15	Alward and Phelps, 2019; Byrd, 2019; García, 2015; Gierlich-Joas et al., 2020; Kuscu and Arslan, 2016; Leeuwen, 2002; Maduka et al., 2018; Norman et al., 2020; Panteli et al., 2019; Roy, 2012; Ruiller et al., 2019; Savolainen, 2014; Torre and Sarti, 2020; VanWart, Roman, X. H. Wang, et al., 2019; Vrana and Singh, 2021
Organizational skills	11	Byrd, 2019; García, 2015; Klein, 2020; Klus and Müller, 2021; Loucks and Ozogul, 2020; Maduka et al., 2018; Purvanova et al., 2021; Roy, 2012; Torre and Sarti, 2020; Vrana and Singh, 2021; Ziek and Smulowitz, 2014
Coaching skills	9	Alas, 2002; Cortellazzo et al., 2019; Klein, 2020; Klus and Müller, 2021; Kuscu and Arslan, 2016; Loucks and Ozogul, 2020; Roy, 2012; Shah and Patki, 2020; VanWart, Roman, X. H. Wang, et al., 2019
Decision making skills	8	Cortellazzo et al., 2019; García, 2015; Klus and Müller, 2021; Leeuwen, 2002; Maduka et al., 2018; Torre and Sarti, 2020; VanWart, Roman, X. H. Wang, et al., 2017; Wargin and Dobiéy, 2001
Change management skills	7	Cortellazzo et al., 2019; Gierlich-Joas et al., 2020; Leeuwen, 2002; Shah and Patki, 2020; Torre and Sarti, 2020; VanWart, Roman, X. H. Wang, et al., 2017, 2019
Networking skills	3	Cortellazzo et al., 2019; Klein, 2020; Mohammad, 2009

Table 2.   Proximal attributes for e-leadership identified by the systematic review.

Communication skills. Particularly in light of the communication challenges that digital technology poses for leaders and employees, good communication skills were highlighted as essential for e-leaders. E-leaders must strive for stringent communication transparency and clarity (Klein, 2020; Savolainen, 2014) and develop high verbal and written communication skills (Kuscu and Arslan, 2016) included rhetoric skills (Leeuwen, 2002) to achieve the highest possible communication efficiency (Ziek and Smulowitz, 2014). Also, "listening to see" is particularly important for good communication skills: e-leaders need to listen effectively without visual cues and focus on the content of the message (Byrd, 2019; Mohammad, 2009; Passey, 2014; Ruiller et al., 2019), while also being careful senders of messages that avoid the risk of misunderstanding (VanWart, Roman, X. H. Wang, et al., 2019). Providing timely and substantive feedback and actively involving followers are essential communication skills to overcome the uncertainties in virtual contexts and achieve performance outcomes (Kerfoot, 2010; Loucks and Ozogul, 2020; Maduka et al., 2018). In times of information overload, it is also important to distinguish between important and unimportant information and to present the information to the employees in a summarised way (Alas, 2002). Moreover, effectively combining digital communication technologies such as messengers and face-to-face virtual meeting software can foster

team proximity (Ruiller et al., 2019). Finally, foreign language skills (Klus and Müller, 2021) or the establishment of a common vocabulary of technical terms (Roy, 2012) facilitate communication in globally distributed virtual teams.

Technological skills. E-leaders' competence in understanding and purposefully using digital technologies was highlighted as indispensable for e-leadership effectiveness. Specifically, e-leaders need to combine a variety of digital tools to overcome communication barriers (Byrd, 2019; Cortellazzo et al., 2019) and be able to drive organizational progress with data analytic skills (Gierlich-Joas et al., 2020; Klein, 2020). Knowledge of the various technological options in terms of digital literacy (Klus and Müller, 2021) enables e-leaders to decide when and how to use the technology provided (Maduka et al., 2018) and to understand the opportunities offered by digital technology (Torre and Sarti, 2020). In addition, sound technological knowledge enables e-leaders to optimize its usage from a cost-benefit perspective and ensure data security and privacy (VanWart, Roman, X. H. Wang, et al., 2019).

Motivational skills. Since virtual contexts carry the risk of alienating followers and weakening social ties, e-leaders need to use motivational skills to encourage the engagement and commitment of their followers. Continuous appreciation and recognition of individual performance (Alward and Phelps, 2019; Kuscu and Arslan, 2016), for example by intrinsic rewards and incentives for achieving goals (García, 2015; Roy, 2012), and enabling freedom and empowerment (Klein, 2020; Orte and Diño, 2019) are essential motivational skills for e-leaders. Despite geographic distance, e-leaders need to demonstrate that they are part of the team (Kuscu and Arslan, 2016) and create a positive relational climate (Torre and Sarti, 2020) to nurture a shared identity (Ruiller et al., 2019). In addition, the e-leader's ability to facilitate interactions and the exchange of ideas and opportunities across boundaries and geographies, and to personalize the work environment through, for example, personal attention to birthdays, can create a fire or sense of "we" within a virtual team (Kerfoot, 2010). Furthermore, e-leaders should promote motivation and team spirit by aligning virtual teams around a common goal and purpose (Byrd, 2019; Maduka et al., 2018; Panteli et al., 2019) and allowing team autonomy (Roy, 2012).

Trust-building skills. Several studies have highlighted mutual trust in the leader-follower relationship as central to successful collaboration in the virtual environment, especially as physical distance makes relationship building difficult (Torre and Sarti, 2020). E-leaders' trust-building skills include granting autonomy to their followers and caring about them as individuals (Alward and Phelps, 2019; Norman et al., 2020). In addition, consistent transparency in decision making and a democratic, participative team environment foster employee trust (Gierlich-Joas et al., 2020; Kuscu and Arslan, 2016; Vrana and Singh, 2021). E-leaders should communicate clear expectations and be accountable for their promises (Alward and Phelps, 2019). Appropriate use of media richness (e.g., videoconferencing versus email) in different situations (Norman et al., 2020) and maintaining work-life balance despite ubiquitous accessibility via digital media (VanWart, Roman, X. H. Wang, et al., 2019) are also related to trust building.

Organizational skills. Organizational skills are essential for e-leaders to lead their teams in virtual environments. Specifically, e-leaders must develop standard operating procedures for virtual meetings and virtual teamwork (Loucks and Ozogul, 2020; Maduka et al., 2018; Purvanova et al., 2021) and be able to set challenging but realistic goals for their team members (Byrd, 2019; Kerfoot, 2010; Vrana and Singh, 2021). In addition, e-leaders must be proactive. In other words, they must anticipate problems and stop them before they occur (Roy, 2012). Due to the distant relationship and the resulting absence of continuous control, a clearly defined and unambiguous delegation of tasks is a critical skill for e-leaders (Roy, 2012; Torre and Sarti, 2020). In addition, e-leaders need the ability to organize themselves effectively (Kerfoot, 2010; Klein, 2020; Klus and Müller, 2021) and to balance the skills of individual team members via mediating technologies (Ziek and Smulowitz, 2014).

Coaching skills. Some researchers emphasized the need for technological coaching skills in addition to e-leaders' own technological skills. E-leaders need to encourage employees to face the difficulties of virtual work (Klein, 2020; Klus and Müller, 2021), ease their fear of changes in their tasks or positions (Klein, 2020) and be able to defuse frustrations that can be caused by a lack of nonverbal communication, technological glitches and ambiguity (Roy, 2012). Using their own skills, e-leaders

should guide their followers especially in using digital technologies and provide opportunities to practice (Loucks and Ozogul, 2020; Shah and Patki, 2020; VanWart, Roman, X. H. Wang, et al., 2019) for creating synergy effects (Alas, 2002).

Change management skills. Change management skills required of e-leaders are related to coaching and organizational skills. Scholars point to the competency to plan, monitor, and refine the adoption of digital technologies for work (VanWart, Roman, X. H. Wang, et al., 2019) and to keep the human side in mind to make better decisions about technology adoption (Cortellazzo et al., 2019; Gierlich-Joas et al., 2020; VanWart, Roman, X. H. Wang, et al., 2017). E-leaders should consider generational differences of their employees regarding technology adoption and offer innovative approaches to promote acceptance (Torre and Sarti, 2020). They should convince their employees to embrace change and encourage innovation (Leeuwen, 2002; Shah and Patki, 2020). In addition, e-leaders need ambidexterity, i.e., the ability to balance old and new technologies and to foresee interrelations and possible conflicts (Klein, 2020).

Decision making skills. Due to the pressure to make faster decisions in the ever-changing virtual environment (Torre and Sarti, 2020; Wargin and Dobiéy, 2001), e-leaders are challenged not to rely on habitual decisions and reactions, but to find new and innovative ways of making decisions (Cortellazzo et al., 2019) if possible considering the opinion of others to reach consensus (Leeuwen, 2002). In addition to their innate distal attributes for successful decision making, such as courage, decisiveness, and assertiveness, they must be able to use their technical skills to decide effectively (García, 2015; Klus and Müller, 2021; VanWart, Roman, X. H. Wang, et al., 2017).

Networking skills. Three studies refer to the networking skills required in the virtual environment. As success in the digital work environment is increasingly influenced by social networks, e-leaders must be able to establish and maintain digital network relationships with various stakeholders (Cortellazzo et al., 2019) and collaborate with partners in distributed ecosystems (Klein, 2020; Mohammad, 2009).

5   Discussion

Our systematic review revealed a variety of distal and proximal attributes that e-leaders must possess to lead effectively in virtual contexts. Although we identified several innate traits in the dimensions of personality, cognitive abilities, motives and attitudes, and core beliefs that support effective e-leadership, we note that proximal attributes, i.e., learnable skills, have received greater attention in the scholarly discussion. These findings suggest that despite some relatively constant inherited traits that promote e-leadership effectiveness, leaders are able to acquire the necessary skills to lead effectively in virtual contexts, rather than requiring an entirely new type of leader in terms of their distal traits.

Comparing our findings to previous research, we find that the distal attributes identified as critical in virtual contexts are largely consistent with those required for effective leadership in traditional contexts (Hoffman et al., 2011; Zaccaro et al., 2018). However, we also note interesting differences in the relative importance of certain e-leader traits compared to leadership in non-virtual contexts. For example, adaptability (Klein, 2020; Klus and Müller, 2021; Kuscu and Arslan, 2016; Shah and Patki, 2020; VanWart, Roman, X. H. Wang, et al., 2017) and risk-taking (Cortellazzo et al., 2019; Shah and Patki, 2020; Torre and Sarti, 2020) were most frequently mentioned as important in our review, while other personality traits such as extraversion and consciousness (Hoffman et al., 2011; Zaccaro et al., 2018) were not mentioned at all. Notably, empirical studies suggest that extraversion and consciousness become less important for leadership effectiveness in contexts of high virtuality (Ruiller et al., 2019; Wilson et al., 2021) compared to situational behavior (Purvanova et al., 2021). Due to physical distance and the challenges of digital communication, charismatic personality traits may therefore lose relative importance, in contrast to traits that enable leaders to act and decide effectively in ambiguous environments. Similarly, we observe that virtual contexts have a high demand for cultural, social, and emotional intelligence, whereas general intelligence, the most important cognitive ability in traditional leadership research (Zaccaro et al., 2018), is losing relative importance. Supportively, Purvanova et al. observed a decreasing influence of general mental abilities in contexts of higher virtuality (Purvanova

et al., 2021). We hypothesize that this observation is due to the increasing divergence of virtual teams, in which the role of e-leaders shifts from managerial tasks such as organizing and planning to social tasks such as promoting shared goals (Byrd, 2019; Maduka et al., 2018; Panteli et al., 2019), building team spirit (Ruiller et al., 2019), and addressing individual concerns (Alward and Phelps, 2019; Norman et al., 2020) that are not naturally resolved through face-to-face communication and activities.

In terms of proximal attributes, research on leadership both in non-virtual and virtual contexts emphasizes the importance of communication skills, other interpersonal skills such as motivational skills, technical skills, organizational skills, and decision making skills. The skills we consider most distinctive to e-leadership are trust-building skills, coaching skills, and change management skills. We hypothesize that coaching and change management skills are particularly relevant in the virtual context due to differences in employee attitudes and knowledge about the digital tools and technologies in use. Older employees in particular may experience the virtual environment as challenging (Torre and Sarti, 2020). In addition, traditional face-to-face activities that naturally build relationships between leaders and followers are lacking (Torre and Sarti, 2020) and need to be replaced by e-leadership efforts to actively build trust by transparent decision making (Gierlich-Joas et al., 2020; Vrana and Singh, 2021), autonomous working (Alward and Phelps, 2019; Norman et al., 2020), clear expectations (Alward and Phelps, 2019), and appropriate use of digital technologies for different situations (Norman et al., 2020).

Our work contributes to both research and practice in the field of e-leadership. While previous research has focused on the applicability of existing knowledge to leading in the context of Covid-19 (Chamakiotis et al., 2021), opportunities and challenges of e-leadership (Contreras et al., 2020), e-leader skills (Byrd, 2019; Cortellazzo et al., 2019), or personality traits (Klein, 2020), our systematic review synthesizes relevant e-leader traits, including distal and proximal attributes. Consequently, this work provides a comprehensive overview of relevant e-leader traits that can promote effective leadership of dispersed followers through the use of technology, which provides a basis for further research, e.g., empirical studies examining the impact of relevant individual traits on leadership effectiveness and other desired outcomes. Moreover, our work offers approaches to address the challenges faced by e-leaders which warrant further investigation. For example, promoting communication or coaching skills adapted to the technology-mediated environment might support overcoming inefficient communication (Park and Cho, 2020; B. Wang et al., 2021), whereas motivational skills could counteract social isolation (Buomprisco et al., 2021). From a practical perspective, the comprehensive view of relevant distal and proximal attributes can allow recruiters to explicitly focus on these attributes in the selection process. The list of proximal attributes can also improve the quality of leadership development programs by helping to train e-leaders. For example, e-leaders can be educated to develop technology skills to become experts in using technology, or to develop change management skills that help them overcome negative attitudes of their followers toward new technologies.

6   Limitations and Conclusion

While we have comprehensively collected and analyzed the academic literature on e-leader traits, characteristics, skills, and competencies, we have not included findings from non-peer-reviewed literature that may be valuable for identifying e-leader traits. We therefore invite further research to expand our review with practitioners' perspectives on e-leader traits. Similarly, we invite studies that investigate whether the experiences of e-leaders in organizations indicate similar traits to those we identified in our review. Furthermore, the additional integration of citing literature, rather than limiting the search to a predefined protocol, could yield more articles and expand the results of our review in the future. In addition, we have made assumptions as to why we may have observed a relatively higher importance of certain leader traits in virtual contexts, but we were unable to examine these assumptions as part of our research. We therefore urge future studies to build on our discussion and improve understanding of the unique challenges of virtual contexts and the implications for effective leadership.

In summary, we conducted a systematic literature review to provide an overview of the scholarly discussion on leader traits for effective e-leadership and identified distal (i.e., personality, cognitive

abilities, motives and attitudes, and core beliefs) and proximal (i.e., skills) attributes of e-leaders. Our research shows that traditional leader traits are also important for effective e-leadership. Leaders must have appropriate technological, communication, motivational, and organizational skills to lead their teams in both virtual and non-virtual contexts. However, certain characteristics and skills are becoming increasingly important to address the unique challenges of virtual contexts: E-leaders need to be more adaptable and willing to take risks to deal with the fluctuating environment, and have higher cultural, social, and emotional intelligence to foster teamwork in divergent and geographically distant teams. Digital technologies require skills in change management, coaching and trust building in addition to in-person leadership skills. Consequently, we contribute to the current discussion on e-leadership by synthesizing the various e-leader traits discussed by scholars and by helping practitioners develop targeted training so that their leaders can develop toward the identified e-leader profile.

Appendix

Author	Year	Research Method	Context	Level of Interaction
Klus and Müller, 2021	2021	Mixed Methods Approach	Business	One-to-one, One-to-many
Purvanova et al., 2021	2021	Quantitative Survey	Business	One-to-many
Vrana and Singh, 2021	2021	Quantitative Survey	Business	One-to-one, One-to-many
Gierlich-Joas et al., 2020	2020	Conceptual	Business	One-to-one, One-to-many
Klein, 2020	2020	Literature Review	Business	One-to-one, One-to-many
Loucks and Ozogul, 2020	2020	Case Study Research	Education	One-to-many
Norman et al., 2020	2020	Mixed Methods Approach	Business	One-to-one, One-to-many
Shah and Patki, 2020	2020	Conceptual	Business	One-to-one, One-to-many
Torre and Sarti, 2020	2020	Case Study Research	Business	One-to-many
Alward and Phelps, 2019	2019	Qualitative Interviews	Education	One-to-many
Byrd, 2019	2019	Literature Review	Business	One-to-many
Cortellazzo et al., 2019	2019	Literature Review	Business	One-to-one, One-to-many
Orte and Diño, 2019	2019	Quantitative Survey	Nursing	One-to-one, One-to-many
Panteli et al., 2019	2019	Case Study Research	Nursing	One-to-one, One-to-many
Ruiller et al., 2019	2019	Case Study Research	Business	One-to-one, One-to-many
VanWart, Roman, X. H. Wang, et al., 2019	2019	Case Study Research	Public	One-to-one, One-to-many
Maduka et al., 2018	2018	Case Study Research	Business	One-to-many
VanWart, Roman, X. H. Wang, et al., 2017	2017	Conceptual	Public	One-to-one, One-to-many
Kuscu and Arslan, 2016	2016	Qualitative Interviews	Education	One-to-many
García, 2015	2015	Literature Review	Education	One-to-many
Passey, 2014	2014	Case Study Research	Education	One-to-many
Savolainen, 2014	2014	Case Study Research	Business	One-to-one, One-to-many
Ziek and Smulowitz, 2014	2014	Mixed Methods Approach	Business	One-to-many
Roy, 2012	2012	Conceptual	Business	One-to-one, One-to-many
Kerfoot, 2010	2010	Conceptual	Business	One-to-many
Lanvin and Kralik, 2009	2009	Conceptual	Business	One-to-many
Mohammad, 2009	2009	Conceptual	Business	One-to-one, One-to-many
Alas, 2002	2002	Conceptual	Business	One-to-one, One-to-many
Leeuwen, 2002	2002	Conceptual	Business	One-to-one, One-to-many
Wargin and Dobiéy, 2001	2001	Conceptual	Business	One-to-one, One-to-many

Table 3.   Method, contexts and level of e-leadership interaction of the analysed studies.

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