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# Leadership in virtual teams: A multilevel perspective

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ABSTRACT

Understanding leadership functioning in virtual teams becomes critical as organizations increasingly use dispersed teams for talent acquisition. In the current article I present a preliminary model that explicates how task- and relationship-oriented leader behaviors influence team and individual processes and outcomes in virtual teams. Further, I discuss cross-level relationships between virtual team and individual processes, as well as the boundary effects of contextual factors (i.e., task complexity, task interdependence, and virtuality) in virtual leadership functioning.



## 1. Introduction

"Virtual teams are here, and they are here to stay."—Bell and Kozlowski (2002, p. 45)

The Society for Human Resource Management (SHRM) conducted a survey of 379 HR professionals, revealing that nearly half of the polled member firms use virtual teams in their organizations (Minton-Eversole, 2012). The popularity of virtual teams in modern organizations is attributed to successes of structuring work around teams, advancements of information and telecommunication technology, globalization and increasing pressures to compete for talent around the world, desires to maintain flexibility and agility while reducing operating costs, and the need to share knowledge and information efficiently (Townsend, DeMarie, & Hendrickson, 1998).

Virtual teams can benefit both employees and the employer (Maruping & Agarwal, 2004). Employees may enjoy the flexibility of conducting their work in far-flung locations, ranging from their employer offices to client sites and from hotel rooms to their homes. Such flexibility may facilitate the balance of employees' work and life and potentially increase their satisfaction with the job. While employees may find it flexible in a virtual work environment, the employer tends to benefit from the enhanced ability to work with experts from around the globe. Thanks to the advanced communication technology, the employer may bring subject matter experts from another part of the world to work in a virtual team, which may be unrealistic in traditional face-to-face teams (Maruping & Agarwal, 2004). Even co-located teams have increasingly incorporated technologies that facilitate virtual communication in team member interactions (Moser & Axtell, 2013). Almost every team has some elements that allow it to be considered partially virtual (Al-Ani, Horspool, & Bligh, 2011; Cheshin, Kim, Nathan, Ning, & Olson, 2013; Hardin, Fuller, & Davison, 2007; Kirkman & Mathieu, 2005; Zigurs, 2003).

All the aforementioned benefits are based on the assumption that virtual teams are well managed. Indeed, leadership effectiveness plays a pivotal role in the success of virtual teams (Bell & Kozlowski, 2002; Morgeson, DeRue, & Karam, 2010; Zigurs, 2003). Researchers agreed that it is more challenging to lead virtual teams than traditional face-to-face teams (Bell & Kozlowski, 2002;

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Cohen & Gibson, 2003; Hoch & Kozlowski, 2014). While relationship development among members in a traditional team can be organic and natural, virtual leaders might need to proactively guide the relationship building process, given the reduced richness of social information through computer-mediated communication tools. Virtual leaders are expected to invest more time and effort to help coordinate virtual team tasks, build relationships among distributed members, and facilitate team processes (Bell & Kozlowski, 2002; Purvanova & Bono, 2009; Tyran, Tyran, & Shepherd, 2003; Zigurs, 2003). It is not surprising that Gilson, Maynard, Young, Vartiainen, and Hakonen (2015) have identified leadership as one of the most pressing themes in research on virtual teams and considered leadership an opportunity in future research.

However, gaps exist in our understanding of leadership effectiveness in virtual teams. First, with only a few exceptions (Hill & Bartol, 2016; Joshi, Lazarova, & Liao, 2009), we know very little about through what processes leadership impacts virtual team effectiveness. As Hoch and Kozlowski (2014, p. 399) suggested, "… the next increment should turn attention to the mediating mechanisms that link the input factors with team performance." Many questions remain unanswered. Are there team processes that are unique to a virtual context? How do traditional team processes and emergent states impact team outcomes under virtual leadership? What are some leader behaviors that can facilitate the development of such processes and emergent states to enhance virtual team effectiveness? Second, despite the acknowledgement of the importance of leaders building relationships in virtual teams, the current literature is silent about how the team leader develops and maintains relationships with each individual member within a virtual team. Meanwhile, while interacting with each team member, how do leader behaviors impact the follower's cognition, affection, and motivation? Third, we lack understanding of how virtual team processes and emergent states at the unit level influence individual experience and performance within the team. Do members perceive and experience team processes if they are not located together? Fourth, there is a dearth of research on boundary conditions of virtual leadership effects. Are there any other contextual factors that may strengthen, weaken, or nullify the effect of leadership in virtual teams? How does individual functioning differ based on different virtual leadership? There are many questions that deserve a closer examination. It is paramount to address the aforementioned gaps in order to realize the benefits of using virtual teams. Together, providing answers to these questions warrants a multilevel perspective as variables residing at the team and individual levels as well as cross-level relationships are involved.

Given that the extant literature is limited and fragmented in providing a comprehensive understanding of leadership in virtual teams, it is imperative that we have a theoretical framework that systematically examines how leadership functions at different levels in virtual teams. This article seeks to address the above described gap in the current literature. Its goal is to promote the understanding of effective leadership in virtual teams by: 1) increasing virtual team researchers awareness of the importance of a multilevel approach; 2) proposing a model of leadership in virtual teams that takes into account the multiple levels at which leaders may influence teams, cross-level influences, and specific variables that are expected to play key roles in impacting leadership in virtual teams given the unique challenges faced by such teams; and 3) providing general theoretical propositions that suggest future research directions. The proposed theoretical framework is presented in Fig. 1.

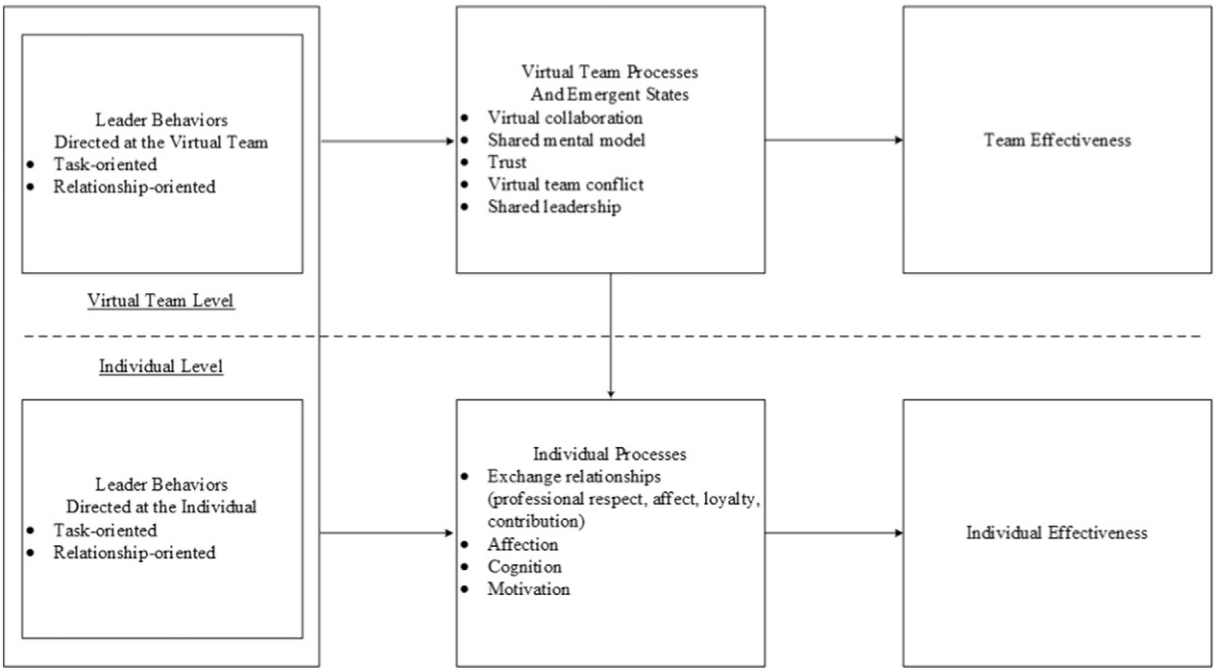


**Fig. 1.** A multilevel model of leadership in virtual teams.

In the sections that follow, I will first briefly revisit the definition and features of virtual teams. Then, I discuss the importance of a multilevel perspective and present a multilevel framework to illustrate leader behaviors directed at the entire virtual team and the ones directed at individual team members. Further, I explain how virtual leader behaviors affect team and individual effectiveness through virtual team processes and emergent states and individual cognition, affection and motivation, respectively. In addition, I explicate cross-level relationships and contexts in virtual team leadership. The article ends with some recommendations for empirically testing the relationships proposed in the framework.

## 2. Features of virtual teams

Research in virtual teams has emerged since the early 1990s, alongside the popularity of virtual communication tools such as e-mails, video conferences, and other internet-based groupware. Scholars have developed several definitions of virtual teams (Hertel, Geister, & Konradt, 2005; Townsend et al., 1998; Zigurs, 2003). Although these definitions differ in terms of their specific languages, they share three defining attributes that Cohen and Gibson (2003) summarized. First, a virtual team is a functioning team. Namely, it is a collection of individuals who work on tasks that share varying degrees of interdependence and mutual accountability to accomplish a common goal. Second, these individuals are dispersed in certain ways. Third, and arguably the most important feature is that instead of interacting face-to-face in traditional teams, members of virtual teams primarily rely on technology to connect and communicate with peer team members. It is noteworthy that traditional face-to-face teams and virtual teams are not dichotomous. Instead, teams are located on a continuum that represents various levels of virtuality (Kirkman & Mathieu, 2005). At one extreme, team members do not meet face-to-face at all and use virtual tools for all team communication; while at the other extreme, team members meet on a daily basis and do not communicate via any virtual channels at all (Al-Ani et al., 2011; Bell & Kozlowski, 2002; Kirkman & Mathieu, 2005; Zigurs, 2003). Lying in between, there are partially virtual teams where face-to-face interactions are accompanying by various degrees of virtual communication (Cheshin et al., 2013; Gurtner, Kolbe, & Boos, 2007). Accompanying structural dispersions is social distance. For example, cultural dispersion (Gibson & Gibbs, 2006; Krumm, Terwiel, & Hertel, 2013; Zigurs, 2003) has been identified as the most common dimension of global virtual teams. Although cultural dispersion does not define virtuality, it adds difficulty to virtual team communication. For the ease of illustration, virtual teams and face-to-face teams are used to exemplify extreme cases of virtuality in the current article, despite the fact that most teams are partially virtual (Cheshin et al., 2013; Kirkman & Mathieu, 2005).

## 3. The importance of a multilevel approach to studying team leadership

In the team leadership literature, researchers have emphasized the importance of viewing leadership functioning within teams as a multilevel phenomenon (Braun, Peus, Weisweiler, & Frey, 2013; DeChurch, Hiller, Murase, doty, & Salas, 2010; Hunt, 1991; Mossholder & Bedeian, 1983; Schriesheim, Wu, & Scandura, 2009; To, Tse, & Ashkanasy, 2015; Wang & Howell, 2010, 2012; Wang, Zhou, & Liu, 2014; Wu, Tsui, & Kinicki, 2010; Yammarino & Dansereau, 2008). Abundant evidence from traditional face-to-face teams confirms that leadership at the individual level is influential on a variety of employee attitudes and behaviors (e.g., Dulebohn, Bommer, Liden, Brouer, & Ferris, 2012), while leadership at the team level impacts not only team processes and outcomes but also individual effectiveness (Morgeson et al., 2010).

The phenomenon that leadership functions at both the team and individual levels is also true in a virtual context. The team leader may exhibit behaviors that are directed at the entire virtual team (e.g., organize a virtual conference meeting with all members), while maintaining separate interactions with each team member specifically (e.g., sending e-mails or making phone calls to each individual separately). The various gaps in the current virtual team leadership research involve important relationships that are under-investigated at multiple levels within virtual teams. Thus, it is necessary to adopt a multilevel lens in studying virtual team leadership. For example, without a multilevel perspective, we are not able to investigate how the leader (team-level) facilitates the development of team processes and emergent states (team-level) in influencing individual experience (individual-level) in the virtual team. How team characteristics (team-level) may change a team member's reaction (individual-level) to virtual leadership behavior (team-level) also cannot be answered without turning to a multilevel framework. Indeed, the gaps identified in the introduction section indicates our limited knowledge about how leader behaviors contribute to virtual team processes and outcomes, how leadership influences individual members' attitudes and behaviors within virtual teams, and how leadership influence processes are involved in relationships that span multiple levels. An important reason for such a limitation, arguably, is the lack of a theoretical framework that guides such research. Building on existing multilevel team studies as well as the theories and findings of virtual team leadership, I propose a multilevel framework for virtual leadership research.

## 4. Leadership in virtual teams: development of a multilevel framework

Leadership plays an important role in overcoming challenges of virtual teams and realizing potential benefits. In line with the tradition of leadership research, scholars interested in virtual leaders have focused on two areas: leader behaviors and leader traits (Gilson et al., 2015). Taking from a behavioral approach to leadership (Judge, Piccolo, & Ilies, 2004; Stogdill, 1950), the current paper focuses on leader behaviors that are either task-oriented (i.e., initiating structure) or relationship-oriented (i.e., consideration) at both team and individual levels. The classic two-dimension framework dominated leadership research from the 1950s to the 1970s and has recently received renewed attention among scholars (Judge et al., 2004; Lambert, Tepper, Carr, Holt, & Barelka, 2012). Task-oriented leader behaviors, or initiating structure, focus on specifying the roles and responsibilities for both

member and leader, clarifying the goals of each task, providing guidance to accomplish tasks, and monitoring work processes. Research has shown that several task-oriented behaviors are related to virtual team success, such as establishing shared norms (Suchan & Hayzak, 2001) and clearly specifying team structures Kaiser, Tullar, and McKowen (2000). Relationship-oriented leader behaviors, or consideration, emphasize the importance of concerning member well-being, support for members, and the establishment of good relationships between leader and members and among members. Examples include behaviors that promote team-building (Kaiser et al., 2000) and facilitate member interactions (De Meyer, 1991). Consistent with the two dimensional leadership frameworks, leadership in virtual teams is demonstrated to be important to structuring tasks and facilitating social-emotional processes within the team (Al-Ani et al., 2011). Depending on the focus, these task- and relationship-oriented behaviors can be either directed at the entire virtual team as a whole, or at individuals within the team (Wang et al., 2014).

As previously stated, the purpose of the current article is to promote research that will contribute to the understanding of leadership in virtual teams. To that end, I adopt a multilevel lens and integrate current team and virtual leadership research to develop propositions. Below I will start explaining the framework by first discussing virtual leadership at the team level, followed by a discussion of virtual leadership at the individual level and then in cross-level relationships. Boundary conditions of the proposed framework will also be discussed.

### *4.1. Virtual leadership at the team level*

At the team level, Bell and Kozlowski (2002) have suggested that leaders in virtual teams not only develop and shape team processes, but monitor and manage team performance. Indeed, collective processes can form and team states may emerge among members working in the same virtual team, because they work on tasks that share certain degrees of interdependence and mutual accountability in order to accomplish a common goal (Cohen & Gibson, 2003). While some scholars have suggested that virtual teams are less likely to be relationship-oriented than their face-to-face counterparts (Elron & Vigoda, 2003), others have highlighted the importance of building relationships and enhancing social-emotional connections among virtual team members (Cogliser, Gardner, Gavin, & Broberg, 2012; Hertel et al., 2005). Furthermore, research and theory has demonstrated the importance of the input-process-output (IPO) model in understanding team functioning (Hackman, 1987; Steiner, 1972). More recent studies have advanced the field by considering multiple mediators that represent both processes and emergent states to explain the effects of certain inputs on team effectiveness (Ilgen, Hollenbeck, Johnson, & Jundt, 2005; Mathieu, Maynard, Rapp, & Gilson, 2008). According to this line of thinking, leadership affects team outcomes through multiple mediators. Following this most recent development in team research, the current research discusses multiple processes and emergent states that are paramount to virtual team effectiveness (e.g., virtual collaboration, shared mental models, trust, virtual conflict, and shared leadership), emphasizing how leader behaviors are related to such processes and emergent states. Note that rather than include all possible team level variables, the current article selectively discusses processes and emergent states that are particularly important in a virtual environment.

#### *4.1.1. Virtual collaboration*

In virtual teams, jobs and tasks are mostly done through virtual channels, making salient the importance of virtual collaboration, which refers to aggregate behaviors enacted by team members in support of effective interactions with teammates in geographically dispersed teamwork environments (Hill & Bartol, 2016). As one of the most important processes within virtual teams, virtual collaboration contributes to team performance (Blackburn, Furst, & Rosen, 2003; Hill & Bartol, 2016). Thus, it is crucial to explore factors that lead to virtual collaboration. Extant research and theory has suggested that team leaders are influential on virtual team performance largely through their impact on virtual collaboration (Bell & Kozlowski, 2002; Gilson et al., 2015; Hill & Bartol, 2016; Malhotra, Majchrzak, & Rosen, 2007; Martins, Gilson, & Maynard, 2004; Zigurs, 2003).

In terms of leader influence on virtual collaboration, both task- and relationship-oriented behaviors are critical. For example, leaders of the Cisco's Global Virtual Team Program wanted to make collaboration in the virtual community part of the instructional strategy for all learner solutions. They realized training on virtual systems can help with overall collaboration and learning, because it is important to keep members informed when implementing new processes in virtual systems so that they can stay on top of changes. Thus, they trained and provided their virtual teams with resources so that members were able to establish and maintain a strong community. They also customized each team's library with step-by-step instructions to help members to access resources they might need. Such task-oriented leader behaviors helped enhance virtual collaboration at Cisco's Global Virtual Team Program. In research, it has been suggested that leader task-oriented behaviors, such as coaching, enhance virtual communication and collaboration (Colquitt, Hollenbeck, Ilgen, LePine, & Sheppard, 2002; Kirkman, Rosen, Tesluk, & Gibson, 2004). In addition to providing guidance and resources necessary for performing tasks in virtual teams, leader behaviors that emphasize the importance of relationships also contribute to virtual collaboration. Fostering good relationships among team members promotes a collaborative context and work climate within a virtual team, and makes members more responsive to and willing to help other team members (Al-Ani et al., 2011; Hill & Bartol, 2016). Given it is likely that members in a virtual team have diverse backgrounds (Maruping & Agarwal, 2004), leaders in such teams need to ensure that all members understand, appreciate, and leverage diversity in order to establish trusting relationships (Malhotra et al., 2007).

**Proposition 1.** *Virtual leadership influences effectiveness of virtual teams via virtual collaboration. Leader behaviors such as training, providing guidance, providing resources, coaching, and relationship building contribute to the development of virtual collaboration, which in turn enhances virtual team effectiveness.*

*4.1.2. Shared mental models*

Another key aspect of teams that leadership influences is shared mental models. Essentially, mental models are "mechanism(s) whereby humans generate descriptions of system purpose and form, explanations of system functioning and observed system states, and predictions of future system states" (Rouse & Morris, 1986, p. 360). Analogous to other emergent states at the team level, mental models of members within the same team may be shared in order to effectively respond to the team environment and task requirements (Cannon-Bowers, Salas, & Converse, 1993). Particularly within a virtual team where communication is more difficult than a face-to-face environment, it is crucial to have the ability to recognize and remember relationships among members and to predict what information and resources are necessary for team functioning (Andres, 2012; Mathieu, Heffner, Goodwin, Salas, & Cannon-Bowers, 2000). Indeed, shared mental models are such emergent states that facilitate communication among persons located in geographically different places and enhance the collective capability in structuring their knowledge about tasks and teams (Mathieu et al., 2000).

According to Cannon-Bowers et al. (1993), four types of shared mental models are typical, i.e., *technology/equipment* (i.e., shared knowledge about the technology and equipment that team members are interacting with), *job/task* (i.e., shared information about how jobs/tasks should be completed in a particular environment), *team interaction* (i.e., shared knowledge regarding how team members interact), and *team* (i.e., shared understanding of team members' knowledge, skills, abilities, and other characteristics). Mathieu et al. (2000) further categorized these four shared mental models into two different types—task (i.e., task-oriented) and team (i.e., relationship-oriented), which corresponds to the two dimensional leader behavior framework adopted in the current article.

Leaders play an important role in facilitating the formation of shared mental models within virtual teams. Dionne, Sayama, Hao, and Bush (2010) developed an agent-based computational model and showed that leadership is influential in fostering the development of shared mental models. Such a leadership function is especially critical in a virtual environment, because shared mental models regarding both task and team are different from the ones in face-to-face teams. Compared with face-to-face teams, virtual teams may be equipped with different technology (i.e., computer-mediated technology) that requires the team to share unique knowledge in order to interact. Thus, leaders of virtual teams would need to provide trainings to the entire team so that they share the understanding of how to utilize such technology collectively, while setting clear goals and strategies (Kaiser et al., 2000; Kayworth & Leidner, 2000). In addition to such task-oriented behaviors, creating a team climate that fosters relationships among members is proven to be pertinent to the formation of shared mental models (Suchan & Hayzak, 2001). Indeed, leaders provide opportunities for members to get to know others within the team and build relationships to better interact with each other. For example, in an effort to decentralize the organization and reach "a federation of assets," BP needed to operate across geographically diverse locations using video conferencing and virtual meetings. In order to make sure that everyone involved shared a clear knowledge structure of the task and working relationships, the company assigned a full time leader for each community around the world to enhance knowledge sharing. Such leadership in virtual teamwork allows the organization to continuously share knowledge and encourages employees to learn from one another, which clears the way for the formation of shared mental models.

**Proposition 2.** *Virtual leadership influences effectiveness of virtual teams via shared mental models. Leader behaviors that facilitate knowledge sharing and enhance interactions among virtual team members contribute to the development of shared mental model within virtual teams, which in turn enhances virtual team effectiveness.*

*4.1.3. Trust*

Trust is particularly important in a virtual environment because it reduces members' psychological distance in a physically dispersed team (Jarvenpaa & Leidner, 1999; O'Hara-Devereaux & Johansen, 1994). Trust glues physically isolated individuals together and determines virtual team success (Wilson, Straus, & McEvily, 2006). Since virtual teams tend to be more task-oriented and lean on relationships, building trust has been a challenge (Powell, Piccoli, & Ives, 2004). Early face-to-face meetings help newly launched virtual teams develop trust and generate a sense of respect among each other (Maznevski & Chudoba, 2000; Suchan & Hayzak, 2001). More social communication is believed to be related to higher levels of trust within virtual teams (Jarvenpaa & Leidner, 1999). Thus, leaders of virtual teams need to set up periodical media-rich communication channels for members to exchange information in a synchronous format (e.g., videoconferencing, real-time web-based collaboration tools). Besides focusing on behaviors that lay foundations for communications regarding tasks, it is suggested that leaders create opportunities for team members to meet in person, as face-to-face interactions are irreplaceable for trust building (Jarvenpaa & Leidner, 1999; O'Hara-Devereaux & Johansen, 1994). For example, at SoftCo, a global developer of Business Process Automation, leaders enhanced trust within virtual teams by increasing communication through e-mails and offering more opportunities for face-to-face interactions (Griffith, Sawyer, & Neale, 2003). Also, setting clear team norms and expectation and creating opportunities for members to share experiences through repeated interactions helped build trust among members (Bradach & Eccles, 1989; Lewis & Weigert, 1985; Mayer, Davis, & Schoorman, 1995). Also, enhancing transparency has been demonstrated to be particularly valuable for trust building in virtual teams (Jarvenpaa, Knoll, & Leidner, 1998).

Special cases exist when virtual teams are temporarily created to perform a task. Under such situations, a unique type of trust called "*swift trust*" may be formed (Jarvenpaa & Leidner, 1999). Compared with traditional trust, interpersonal dimensions are not required in building swift trust. Instead, prior experiences in similar situations provide shortcuts (i.e., categorical social structures) for members to interact, while trust is maintained by actions and results that confirm the effectiveness of interaction (Meyerson,

Weick, & Kramer, 1996). In such virtual teams with a limited life span, leaders' immediate feedback regarding team functioning helps develop swift trust because it provides members with confidence that they are able to collaborate.

**Proposition 3.** *Virtual leadership influences effectiveness of virtual teams via trust. Leader behaviors such as setting up early face-to-face meetings, using media-rich communication channels, and facilitating information exchange in a synchronous format all contribute to the trust building within virtual teams, which in turn enhances virtual team effectiveness.*

#### *4.1.4. Virtual team conflict*

In order to lead a virtual team and enhance its effectiveness, it is paramount for leaders to manage conflict (Wakefield, Leidner, & Garrison, 2008). Team conflict refers to members' perceptions of their individual differences, incompatibilities, and irreconcilable wishes and desires (Boulding, 1963). Team conflict can be differentiated based on whether the conflict regards relationships, tasks, or processes (Jehn, 1995). Team members' awareness of interpersonal differences are considered relationship conflict, while task conflict refers to members' perceptions of their different opinions regarding team tasks. Related to task conflict, process conflict occurs when members perceive differences in how they go about team tasks.

In line with the relationship-task leadership framework, the current article considers both task and process conflicts within a broader domain that is task-oriented. Research has shown that relationship conflict almost always carries a negative impact on team functioning (Griffith et al., 2003). Yet certain levels of task conflict can be beneficial for team effectiveness, because of the different viewpoints brought by members (Jehn & Mannix, 2001). Relationship team conflict is arguably more likely to occur in virtual teams, because individuals are more prone to attribute malfunctioning team processes and/or behaviors that violate norms to personal rather than situational factors in a virtual environment (Cramton, 2001). Thus, differences that are viewed as task conflict in a face-to-face team may be interpreted as relational conflict that eventually hampers effective collaboration among members, accentuating the importance of leader behaviors that focused on virtual team relationship building. Effective communication can be conducive to avoiding relationship conflicts. To promote member communication in virtual teams, leaders may consider organizing face-to-face meetings and "virtual parties," establishing communication routines, and enabling virtual communication channels that are accessible when needed.

Leader behaviors that clarify members' task responsibilities and guide task coordination are conducive to reducing task conflict and enhancing team effectiveness. Also, leaders may hold virtual conferences to have members update work status with each other to avoid potential misunderstanding due to lack of communication. Leaders may enhance team relationships among members through "virtual parties" (Malhotra et al., 2007), reducing relationship conflict. Removing obstacles to interpersonal relationships lay the foundation of other team processes (Marks, Mathieu, & Zaccaro, 2001). Thus, to avoid task conflicts in virtual teams, leaders are encouraged to use virtual communication tools to clarify task responsibility, facilitate task coordination, and keep team members updated about everyone's work status.

Managing conflict is even more challenging for partially virtual teams where some members rely on computer-mediated communications while others still meet face-to-face. Such different communication patterns may generate distinct interaction norms within a team and deepen the division between physically divided team members (Cheshin et al., 2013). With regard to leader-member interaction, it is likely that the leader forms an in-group with members he/she can meet face-to-face, because communication cost is lower for the leader to interact with collocated members (Fussell, Kiesler, Setlock, & Scupelli, 2004). Such in- vs. out-group differences may aggravate conflict and, therefore, warrants special attention from leaders.

**Proposition 4.** *Virtual leadership influences effectiveness of virtual teams via preventing and resolving virtual team relationship and task conflicts. Leaders in partially virtual teams need to pay particular attention to bridging members who are collocated and those who are located in geographically dispersed places to promote team effectiveness.*

#### *4.1.5. Shared leadership*

Because of the increased difficulty in influencing and motivating followers in a virtual context, researchers have suggested that leaders in a virtual environment focus on enhancing the self-management ability of their teams (Carte, Chidambaram, & Becker, 2006; Zigurs, 2003). Such self-managing teams are believed to have shared leadership, which represents a process by which team members share responsibilities, mutually influence and guide each other, and conduct collaborative decision making (Hoch & Kozlowski, 2014). Distinct from traditional hierarchical leadership, shared leadership has an influence process that is more lateral rather than upward or downward (Al-Ani et al., 2011), and is a form of collective effort that enhances team performance in an electronic context (Carte et al., 2006).

Shared team leadership is a critical antecedent to team performance (Carte et al., 2006; Hoch & Kozlowski, 2014). Note that shared leadership among team members and leadership of a designated team leader is not contradictory. Within a virtual environment, shared team leadership supplement the traditional hierarchical leadership and structural supports in influencing team functioning (Hoch & Kozlowski, 2014). Even teams exhibit high levels of shared leadership retain and are influenced by external leadership (Stewart & Manz, 1995). In fact, leaders may facilitate the formation of shared leadership within teams, while shared leadership may complement formal leadership. For example, Wageman (2001) showed that leader initiating structure and team goal setting behaviors work well with shared leadership that focuses on executing and monitoring team work. In a virtual environment, leaders may formalize the team goals and communicate them to the entire team via e-mail, while virtual leaders may ask members to take responsibilities for various tasks during virtual conferences and encourage them to periodically report on

their work status to everyone else in the team. Furthermore, shared leadership emerged in virtual teams is "best characterized as task leadership" (p. 325, Carte et al., 2006). Thus, assigned leaders still have the responsibility in building trusting relationships within virtual teams, which in turn facilitate the emergence of shared leadership and enhance team performance.

**Proposition 5.** *Leaders in virtual teams enhance team effectiveness by facilitating the formation of shared leadership among team members. Shared leadership may supplement traditional leadership in providing structural support. Yet virtual leaders still assume the responsibility of building trust and relationships among team members.*

### *4.2. Virtual leadership at the individual level*

Thus far, I have explained the team level relationships in the framework shown in Fig. 1. Yet, leaders not only interact with the entire team but also influence each member individually, making it important to simultaneously consider leader-team and leader-follower interactions (Zaccaro, Heinen, & Shuffler, 2009). Within traditional face-to-face team research, studies that examine this dual-process were very limited a decade ago (Wang & Howell, 2010). Fortunately, there has been burgeoning research on multi-level team leadership in recent years, providing us with a more comprehensive view of leadership functioning in teams (e.g., To et al., 2015; Wang & Howell, 2010, 2012). In the context of virtual teams, however, almost all the studies thus far have focused on how the leader influences team processes and outcomes. Conspicuously lacking is research on how leaders in virtual teams influence each member individually. While leaders exhibit behaviors that are directed at the entire virtual team as a whole, they also need to interact with each team member individually, because every team member faces challenges that are unique to their local work environment (Hill & Bartol, 2016). Indeed, virtual leader behaviors directed at the individual levels are paramount in shaping employee cognitive, affective, and motivational states, and contributing to individual effectiveness.

Similar to leader behaviors at the team level, leaders in virtual teams may focus their behaviors on tasks and/or relationships when they interact with members individually. One of the most useful approaches to understanding the effect of leadership at the individual level is leader-member exchange (LMX; Dansereau, Cashman, & Graen, 1973; Dansereau, Graen, & Haga, 1975; Dulebohn et al., 2012; Gerstner & Day, 1997; Liden, Sparrowe, & Wayne, 1997). Distinct from other approaches to leadership, LMX focuses on leader interaction with each member within the team and the quality of such a dyadic relationship. Liden and Maslyn's (1998) multidimensional perspective on LMX shows that the leader interacts with individual followers based on four dimensions: *affect* (i.e., mutual affection leader and member have for each other based on relationships rather than task-related aspects), *loyalty* (i.e., public expression of support for each other), *contribution* (i.e., the amount, direction, and quality of task efforts put forth toward mutual goals), and *professional respect* (i.e., confidence in each other's abilities, skills, and knowledge in performing tasks). Meta-analyzing 290 samples from 247 studies published in the past 40 years, Dulebohn et al. (2012) found that LMX relationships have significant impacts on critical employee attitudinal and motivational conditions such as job satisfaction, commitment, turnover intention, and fairness perceptions.

Research has demonstrated that due to the power difference between two parties in that relationship, leaders are dominant in determining the development of LMX, which in turn influences individual effectiveness (Dienesch & Liden, 1986; Dulebohn et al., 2012; Liden et al., 1997). Both task- and relationship-oriented leader behaviors contribute to the quality of LMX, potentially with differential impact on different dimensions of LMX. In a virtual context, before teams begin their official projects, leaders need to be sure that everyone is comfortable with the information technology used in virtual teams. Individuals have varying degrees of comfort regarding virtual technology (Schepers, Wetzels, & de Ruyter, 2005). For instance, the millennials growing up with wide exposure to virtual communication are more familiar with computer-mediated technology than their baby boomer counterparts. Thus, in addition to providing overall training of information technology to the entire team, leaders need to pay special attention to varying degrees of comfort. Leaders are expected to make sure that everyone, especially members who are not digital natives, knows how to use the communication channel and is positive about it.

#### *4.2.1. Professional respect*

Leaders in virtual teams are the ones who best know the goals, resources, and processes of the entire team. Especially in virtual teams where synchronous coordination is challenging, members can experience confusion about their roles and means to accomplish their tasks. Leaders in such work contexts may clarify each member's responsibility in individual emails and provide guidance that is relevant to each member's idiosyncratic situations. Such customized task advice not only guides individuals in completing their tasks, but enhances members' respect for leaders' professional knowledge and skills, identifying leaders as role models whom they want to follow.

#### *4.2.2. Contribution*

Leaders' task-oriented behaviors directed at individuals enhance members' motivation to exert greater efforts in work-oriented activities. Specifically, leaders in virtual teams may initiate private chats through instant messenger or phone calls with each member to understand their needs. Based on members' unique local environments, leaders can assist members in setting personalized work goals and identifying procedures to accomplish jobs. Such individual coaching from leaders enhances follower self-efficacy and work motivation and has been proven to be beneficial (Brake, 2006). In addition, leaders may need to provide members with valued resources (e.g., budgetary support, equipment) and feedback (Brake, 2006) to increase members' willingness to exert effort in tasks.

#### 4.2.3. Affect

In addition to advising and supporting each member's tasks, leaders may enhance their followers' affection toward them through relationship-oriented behaviors. Leaders' messages and behaviors play an important role in members' affective reactions (Avolio, Sosik, Kahai, & Baker, 2014). To develop high quality relationships with members, leaders may go beyond assisting each member's tasks to exchange social/personal information with each follower (Zaccaro & Bader, 2003). Customizing some personal information in an e-mail or chatting with members regarding their family events can be conducive to enhance the socio-emotional bond. Such relationship-building behaviors shown by leaders will promote followers' perceptions of leaders being personal and increase the possibility that followers see their leaders as friends.

#### 4.2.4. Loyalty

Another way that leaders may solidify the relationship with followers is through its public support for members. Defending members to others contributes directly to enhanced loyalty. For instance, when a team member's work is questioned by upper management during a video conference, instead of blaming the follower, the leader may come to his/her defense and help explain the situation. Such public support may substantially help build a trusting relationship with followers.

It is noteworthy that in partial virtual teams, as Fussell et al. (2004) suggested, leaders have the tendency to interact with members who are collocated with them more and develop them as in-group members. Indeed, Napier and Ferris (1993) found that physical distance between leader and member negatively affected quality of LMX relationships. Thus, leaders in such teams need to overcome such biases and find ways to understand and develop each member. Consistent with Graen and Uhl-Bien's (1991) contention that leaders should develop high quality exchange relationships with all followers, Malhotra et al. (2007) concluded that "the most effective virtual team leaders enhance the team experiences for *each of their members* by ensuring that *each* [italic added by the author] has an opportunity to learn, grow, contribute, and feel an integral part of the team" (p. 68). In sum, because it requires that leaders consider unique local environments that each member faces, virtual teams present additional challenges to leaders in terms of developing high quality relationships with each follower and enhancing their affection, loyalty, contribution, and professional respect. Yet through close interactions with each member, leaders can build a highly trusting relationship with everyone and increase their task motivation, which in turn contributes to individual effectiveness.

**Proposition 6.** *Virtual leadership influences individual cognition, affection, motivation, and exchange relationships between leader and member in virtual teams.*

**Proposition 7.** *Individual cognition, affection, motivation, and exchange relationships between leader and member mediate the effect of virtual leadership on individual effectiveness in virtual teams.*

### 4.3. Cross-level relationships in virtual teams

Research in teams has traditionally examined processes within teams in a parallel fashion, exploring functional homogeneity of processes at the team and individual levels, respectively (Chen, Bliese, & Mathieu, 2005; Kozlowski & Klein, 2000). Recently, scholars have embraced the notion that processes and emergent states at the team level can influence individual processes in a cross-level manner (Chen & Kanfer, 2006; Chen, Kanfer, DeShon, Mathieu, & Kozlowski, 2009). For example, Kukenberger, Mathieu, and Ruddy (2015) found that team-level processes and emergent states such as empowerment positively impacted individual members' informal learning and commitment in the team. Chen et al. (2009) demonstrated that team-level efficacy is positively related to individual-level self-efficacy.

Indeed, employees working in teams not only see themselves as individuals but also incorporate team membership into their definition of self (Tajfel & Turner, 1986). As social cognitive theory postulates, affection, cognition, and motivation processes can be contagious, because individuals can learn simply by observing and replicating behaviors of other members within the same team (Bandura, 1977; Bandura, 1997). Such an influential process is believed to be cross-level. In terms of affective conditions, being associated with a team where everyone strongly endorses relationships with others enhances one's affective connection to others and to the team. In terms of cognition, affiliating with a team of people who are capable of accomplishing group tasks enhances one's belief that he/she can also possess the capability and become successful through comparable actions. On the contrary, belonging to a group of people sharing doubts in their capacities and anticipating failures undermines one's own efficacy and effort (Bandura, 1994). In addition, cross-level motivational processes have also been theoretically suggested (Chen & Kanfer, 2006) and empirically supported (Chen et al., 2009).

The processes and emergent states in virtual teams are expected to have similar cross-level effects on individual members' affective, motivational, and cognitive processes in teams. The current article will illustrate this relationship using the selected virtual team processes and emergent states discussed earlier. When virtual collaboration is high, members efficiently interact with each other, despite their physical distance (Blackburn et al., 2003; Hill & Bartol, 2016). Such a close and effective collaboration instills in each individual confidence in the team, assisting them in overcoming potential anxiety resulted from working in a virtual environment and enhancing their motivation. Shared mental models also contribute to individual functioning within a virtual team. Because of the dispersed nature of a virtual environment, one of the most salient challenges a member may face in a virtual team is the difficulty in gaining a systematic understanding of how tasks should be done collectively, what relationships among members are, where resources that are available, and what knowledge, skills, and abilities everyone has in the team. Thus, having a shared mental model that clarifies tasks and relationships (Mathieu et al., 2000) within teams are instrumental

for each individual to feel comfortable and supported in conducting their individual job tasks. In a similar vein, trust within virtual teams helps each member to communicate freely with one another and encourages individuals to take initiatives and even risks when carrying out their tasks. On the other hand, if conflict arises in a virtual context, members are likely to react negatively to incompatibilities they perceive (Jehn, 1995), withholding their effort, lowering their motivation, and detaching from the team. Finally, shared leadership provides each virtual team member with a sense of ownership and empowerment that motivates them in advancing their work collectively.

Cross-level moderation processes also exist and should be considered by future research. In a sample of 193 employees from 29 teams in a procurement organization of a large multinational company, Hill and Bartol (2016) found that virtual, empowering leadership moderated the effect of individual virtual teamwork situational judgment on how well individuals virtually collaborated with others. When virtual leaders exhibited high levels of empowering leadership, individual situational judgment positively led to virtual collaboration. Yet such positive connection was not significant when virtual empowering leadership was low. Hill and Bartol's study is an example of how virtual leadership may influence individual functioning within the team.

**Proposition 8.** *Virtual leadership, virtual team processes and emergent states influence individual cognition, affection, and motivation (cross-level direct effects).*

**Proposition 9.** *Virtual leadership moderates important individual-level processes in virtual teams (cross-level moderations).*

### *4.4. Considering context in virtual leadership*

Bell and Kozlowski (2002) presented a model that discusses leadership challenges in various types of virtual teams, emphasizing the critical role of task complexity in virtual team structure and processes. This aligns with the idea of path-goal theory (House, 1996): that task characteristics may have important implications on which leader behaviors may be appropriate. According to Wood's (1986) conceptualization, there are three factors that underlie task complexity. First, component complexity refers to the extent to which individuals need to attend to various behaviors and information cues in order to perform the task. Second, coordinative complexity describes the extent to which different task inputs and outputs are associated with each other. The third is dynamic complexity, which refers to the stability of task requirements over time. Based on these dimensions, tasks that are more complex require individuals to have a better understanding of task elements and their relationships and possibly different ways to accomplish the tasks over time. In a team where the virtual context might have already introduced uncertainty and confusion (Bell & Kozlowski, 2002), high task complexity can put extra cognitive burden on members. Therefore, leader behaviors that clarify and guide team tasks and offer advice and resources to individual members may be more important when task complexity is high rather than low.

**Proposition 10.** *Compared with a low task complexity environment, when task complexity is high within a virtual team, leaders' task-oriented behaviors at both the team and individual level have stronger impacts on team and individual processes and outcomes.*

In addition to task complexity, another task characteristic that has received attention from scholars is task interdependence, which assesses the extent to which members of a team need to interact and depend on each other in order to complete tasks (Kiggundu, 1981). In a high task interdependence context, team members are expected to communicate more effectively and have higher trust in fulfilling their mutual responsibilities. It is expected that relationships within the team are more critical to team success when tasks are highly interdependent rather than when it requires little coordination among team members. Thus, it is more important for leaders in virtual teams to focus on relationship building when task interdependence is higher.

**Proposition 11.** *Compared with a low task interdependence environment, when task interdependence is high within a virtual team, leaders' relationship-oriented behaviors at both the team and individual level have stronger impacts on team and individual processes and outcomes.*

The most central defining characteristic of virtual teams is virtuality. How individuals are distributed and the extent to which virtual communication tools are employed are important determinants of team virtuality. Virtual team dispersion is typically captured by two categories, structural dispersion and social distance, with the structural dimension reflecting objective geographic dispersion and social distance manifesting subjective dispersion and cultural/national diversity (O'Leary & Cummings, 2007). In terms of structural dispersion, virtuality can be understood based on three dimensions, including spatial, temporal, and configurational categories (O'Leary & Cummings, 2007). Spatial dispersion refers to the average physical distance between team members and is usually measured in feet or miles. Virtuality in spatial dispersion prevents team members from frequent face-to-face interactions. Temporal dispersion indicates the extent to which team members are located in areas that are in different time zones. In addition to spatial and temporal dispersions, how teams are configured may also differentiate virtuality. Configurational dispersion deals with how exactly team members are located in various sites. A six-member software team may be working at six different sites or just two sites. While these two configurations may result in the same level of average spatial dispersion, coordination and communication requirements may be very different.

Various dimensions of virtuality present challenges to collaboration in virtual teams (O'Leary & Cummings, 2007). Because team members are not typically located in the same location or time zone, they need to overcome challenges include less rich communication media, more difficult coordination of activities, misunderstanding of coworkers, and feelings of isolation

(Purvanova, 2014; Rosen, Furst, & Blackburn, 2006). Compared with face-to-face interactions, virtual environments are relatively lean (Moser & Axtell, 2013). Social and nonverbal cues that are typical to a face-to-face environment can be missing in a virtual context (Daft & Lengel, 1986; Sproull & Kiesler, 1986). It becomes less apparent what coworkers are doing in a virtual environment (Cramton, 2001). Thus, members are less aware of each other's situation (Gibson & Gibbs, 2006). Not surprisingly, it is more important for leaders to take initiative and facilitate team collaboration in virtual teams (Moser & Axtell, 2013). Leadership, therefore, is more important in providing guidance and facilitating coordination in a team with high virtuality than a team that is less virtual (Bell & Kozlowski, 2002; Hill & Bartol, 2016; Hoch & Kozlowski, 2014; Joshi et al., 2009).

**Proposition 12.** *The effects of leader behaviors on team and individual processes and outcomes are stronger in teams with high virtuality than in less virtual teams.*

## 5. Concluding remarks

As information technology advances, virtual teams are increasingly used in today's business world. How to lead a virtual team, therefore, becomes a critical question. Leadership in virtual environments is indeed more challenging than in face-to-face teams (Carte et al., 2006). Coordinating within teams, building trust, forming shared mental models, and managing conflict all require extra efforts than in a traditional team setting. Assigned virtual leaders even face the challenge of establishing their credibility (Al-Ani et al., 2011). Fortunately, sizable research has accumulated to further our understanding of effective leadership in virtual teams during the past decade. The dominant focus on leader influence at the team level, however, leaves many important questions unanswered. Drawing from a two-dimensional perspective (i.e., task- and relationship-oriented) on leader behaviors, the current article presents a preliminary multilevel model that theoretically describes the effects of virtual leadership on processes and outcomes at both team and individual levels, taking into account cross-level impacts of team processes on individual processes.

To empirically test the proposed multilevel virtual leadership framework, it is crucial to ensure an alignment between conceptualization and measurement of multilevel constructs (Kozlowski & Klein, 2000; Wang et al., 2014; Yammarino, Dionne, Chun, & Dansereau, 2005). At the team level, Kozlowski and Klein (2000) discussed three types of constructs (e.g., global, shared, and configural construct). Global constructs describe team-level phenomena that do not have individual-level components. That said, if we conceptualize virtual leadership as a global team construct, it is advisable to assess it from team leader self-reports. On the other hand, shared constructs describe collective phenomena that are based on the shared perception among members. For example, although virtual collaboration is also a team construct, it consists of individual members' shared perception about the quality and intensity of how they cooperate and coordinate in completing team functions. Such individual components are also part and parcel in configural constructs that summarizes pattern or variability of team member properties (Kozlowski & Klein, 2000). Therefore, the measurement of shared and configural constructs should be based on aggregates from individual-level components.

In terms of research design, traditionally, most virtual team leadership research was conducted within laboratory settings, using student samples (Hambley, O'Neill, & Kline, 2007; Martins et al., 2004). Despite its advantage of controlling for key variables and generating causal inference, a laboratory design is inadequate in capturing the complexity and interactions of virtual teams and thus has validity issues. Future research on leadership in virtual teams is encouraged to utilize field research designs. In particular, multilevel designs with longitudinal data collection (Hoch & Kozlowski, 2014) are recommended to test multilevel mediational models.

I hope this preliminary multilevel framework has promise in addressing important gaps in the current virtual team leadership research and helps us move forward with more exciting studies over the years to come.

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