IT-enabled awareness and self-directed leadership behaviors in virtual teams

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ABSTRACT

Despite the pervasiveness of self-managing virtual teams, organizations find it particularly challenging to motivate virtual team members to exhibit and manage their leadership behaviors. This study contributes to virtual team leadership literature by specifically shedding light on how distinct awareness forms enabled by information technology (IT) signal important cues to virtual team members to self-lead, that is, self-direct their leadership behavior in their team. Our results reveal that IT-enabled disclosure awareness is key to inducing several leadership behaviors: directive leadership, supportive leadership and interpersonal helping. Further, for directive leadership and interpersonal helping, the relationship is contingent on IT-enabled task knowledge and IT-enabled presence awareness. At low IT-enabled task knowledge awareness or high IT-enabled presence awareness, virtual team members who perceived IT-enabled disclosure awareness employed directive leadership and interpersonal helping. Opposite results were found at high perceived IT-enabled task knowledge awareness and low perceived IT-enabled presence awareness. This research highlights the critical role played by specific awareness forms enabled by IT in motivating virtual team members to engage in self-leadership.

1. Introduction

Virtual teams are commonly employed in organizations and across industries (Hoch & Kozlowski, 2014; Wakefield, Leidner, & Garrison, 2008). Virtual teams, which comprise geographically dispersed members holding diverse expertise and perspectives, are established to meet challenging market demands (Cramton, 2001; Hoch & Kozlowski, 2014). Virtual team members communicate predominantly via information technologies (ITs), are assembled on an ad-hoc basis to solve complex problems, and are often disbanded after completion of the assigned project (Gibson & Gibbs, 2006). In self-managed virtual teams (henceforth known as virtual teams), members are responsible for defining and regulating their own work processes and do not have formal leaders assigned (Cramton, 2001; Gilson, Maynard, Jones Young, Vartiainen, & Hakonen, 2015; Malhotra & Majchrzak, 2014). There are various types of virtual teams, such as inter-organizational teams, and distributed ad-hoc task groups (Espinosa, Slaughter, Kraut, & Herbsleb, 2007; Gilson et al., 2015; Malhotra & Majchrzak, 2014).

The prevalent use of virtual teams in organizations has attracted significant research (see Gilson et al., 2015 for a review of virtual team studies). Most studies focus on the dynamics and outcomes of virtual teams (Chidambaram & Tung, 2005; Cramton, 2001; Gilson et al., 2015; Hoch & Kozlowski, 2014). Previous research has shown that swift trust established through communication sets a positive tone and develops trust among team members (Gilson et al., 2015). However, other work has indicated that virtual team members are unresponsive, experience deindividuation and engage in social loafing (free-riding on others' efforts) due to reduced visibility (Alnuaimi, Robert, & Maruping, 2010; Chidambaram & Tung, 2005; Cramton, 2001). In a virtual team setting, the

significant lack of social contextual cues and uncertainties regarding one's partners increases the tendency toward misunderstanding and misinterpretation (Cramton, 2001; Gilson et al., 2015). For example, the lack of a physical working context in a virtual team reduces the ability of team members to comprehend the task constraints faced by remote partners, impeding the development of a common ground (Rico, Sánchez-Manzanares, Gil, & Gibson, 2008). In these ways, organizations face challenges in motivating virtual team members to exhibit and manage their leadership behavior.

Despite these concerns, virtual team leadership research has generally ignored *what motivates* individual members to engage in self-leadership within their team (Hoch & Kozlowski, 2014; Stewart, Courtright, & Manz, 2011). The focus of virtual team leadership research has been on shared and emergent leadership. Self-leadership, a facilitator of shared leadership (Houghton, Neck, & Manz, 2003), encompasses how individuals manage their own leadership behavior in a team, and it is an important means to reduce process losses and facilitate team effectiveness (Houghton et al., 2003; Stewart et al., 2011). Shared leadership involves *individual* team members undertaking distributed or overlapping leadership responsibilities and roles, as members influence one another in their efforts to collaborate (Houghton et al., 2003). Team members need to self-lead by deciding when to step in; when to step back; and when to enhance, modify or eliminate certain leadership behaviors during collaboration efforts based on the work situation (Stewart et al., 2011). A team level approach to shared leadership, which involves aggregating the leadership of all team members, however, may cloud such important nuances (D'Innocenzo, Mathieu, & Kukenberger, 2016). An individual lens is important too. Moreover, in the context of virtual teams, existing shared leadership research primarily examines the outcomes of shared leadership. Shared leadership has been shown to positively impact team effectiveness, such as effort, communication, coordination and task performance (Cogliser, Gardner, Gavin, & Broberg, 2012; Hoch & Kozlowski, 2014). Researchers have also explored antecedents of emergent leaders by probing what influences members to be selected as leaders by their peers (Charlier, Greco, & Reeves, 2016; Cogliser et al., 2012; Serban et al., 2016; Yoo & Alavi, 2004). To our knowledge, no research thus far has addressed the antecedents of virtual team member self-leadership, that is, self-directing leadership behavior in the team.

This study bridges the above gap by adopting an awareness lens. Awareness of one's team environment (e.g., teammates) has important implications for work processes and task performance (Malhotra & Majchrzak, 2012, 2014; Rico et al., 2008). We believe that *specific* perceived awareness of one's team environment enabled by ITs may serve as an important cue that encourages and guides team members' self-management of leadership behaviors. This study probes the potential roles played by three distinct awareness forms enabled by ITs: disclosure, task knowledge, and presence. IT-enabled disclosure awareness is relation-oriented and concerns the extent to which one is aware of others' personal information (e.g., hobbies and feelings). By contrast, IT-enabled task knowledge awareness and IT-enabled presence awareness are task-oriented. IT-enabled task knowledge awareness relates to the extent to which one holds information regarding one's task environment (e.g., work progress of others), whereas IT-enabled presence awareness involves being able to reach out to others due to their online availability and accessibility (Malhotra & Majchrzak, 2012, 2014). Various IT features (e.g., instant messaging) that support the development of these forms of awareness (Malhotra & Majchrzak, 2012, 2014) are enabled across different social media tools, such as Facebook and Google Docs (Ellison, Gibbs, & Weber, 2015), which are being increasingly embraced by organizations that utilize virtual teams (Gibbs, Eisenberg, Rozaidi, & Griaznova, 2015).

In short, the primary purpose of the present article is to explore the following: what distinct awareness forms enabled by ITs motivate individual virtual team members to self-lead in terms of leadership styles (directive and supportive) and interpersonal helping (concepts that we will elaborate later)? We focus on these leadership behaviors given their effectiveness in shaping team work processes and outcomes, as is evident from the extensive research (Bass, 1999; Pearce & Sims, 2002; Podsakoff, MacKenzie, & Bommer, 1996; Yoo & Alavi, 2004). We suggest and examine the idea that IT-enabled disclosure awareness is integral in spurring leadership behaviors and that IT-enabled task knowledge awareness and IT-enabled presence awareness are contingency factors to the relationship.

This study employs a field study methodology involving self-managed student virtual teams to test the hypotheses. The participants were distributed across three geographical locations within the same country. The results showed that perceived IT-enabled disclosure awareness induced leadership behaviors. Further, for virtual team members who perceived IT-enabled disclosure awareness, they regulated their leadership behaviors—directive leadership and interpersonal helping—based on IT-enabled task knowledge and IT-enabled presence awareness. Our study adds richness to the self-leadership research involving virtual teams by offering a compelling understanding that specific awareness forms enabled by ITs promote self-leadership of virtual team members. Indeed, it is important to understand how individuals lead themselves before they can lead their team members (Houghton et al., 2003; Manz, 1986). Our study takes an initial and important step in this direction and, thus, indirectly informs shared leadership, also.

We start by describing the concepts and key findings of self-leadership, leadership behaviors and awareness forms enabled by ITs. Next, we put forth the theoretical arguments of our hypotheses. Then, we test the hypotheses and report the results and conclusion.

2. Background

2.1. Strategies for developing self-leadership

Self-leadership is "a new silver bullet(s) for the dawn of a new era of leadership" (Pearce & Manz, 2005, p. 133). Developed mainly from the literature of self-management, self-leadership is a process by which individuals motivate, influence and lead themselves using a set of strategies "toward performance of naturally motivating tasks as well as managing oneself to do work that must be done but is not naturally motivating" (Manz, 1986, p. 589). Within a team, members self-lead by applying self-controlling principles to various behaviors, such as managing interpersonal relations, monitoring work processes or initiating structures

(Houghton et al., 2003; Manz & Neck, 2004; Stewart et al., 2011). There are various strategies for developing team member self-leadership, including natural rewards, self-observation and cueing (Manz & Neck, 2004; Stewart et al., 2011).

Natural rewards emphasize the positive experiences accrued from working on a task. For example, nurses may view certain activities (e.g., bathing patients) as uninteresting, but they will view them more favorably if they focus on the upkeep of patients' comfort and health (Gagne & Deci, 2005). Self-observation "fosters awareness of when certain behaviors occur and why they are chosen" (Stewart et al., 2011, p. 187), thus promoting self-evaluation and understanding of specific behaviors that need to be modified and eliminated (Houghton et al., 2003; Manz, 1986). Cueing strategies include "increasing exposure to stimuli evoking more desirable behavior" (Manz, 1986, p. 364; Manz & Sims, 1980), promoting productive behaviors, and modifying undesirable behaviors (Manz & Neck, 2004). For example, a chart that depicts the progress of a project may act as a stimulus that encourages one to exert more effort toward the project.

To realize optimal team outcomes, the critical roles of team maintenance (e.g., interpersonal relations) and task-oriented behaviors (e.g., monitoring, directing and organizing) need to be fulfilled by members within the team (Manz & Sims, 1987; Zaccaro, Rittman, & Marks, 2001). However, it is unclear what prompts individuals to self-lead in virtual teams (Cramton, 2001; Gilson et al., 2015). We propose that perceived IT-enabled disclosure awareness is a form of natural reward strategy that is critical in promoting leadership behaviors since it engenders liking among other relational aspects (Collins & Miller, 1994; Moore, Kurtzberg, Thompson, & Morris, 1999). IT-enabled task knowledge awareness and IT-enabled presence awareness are task-oriented in nature, and they are forms of self-observation and cueing strategies since they provide awareness of one's own understanding of the team task environment and enable spontaneous communication with one's teammates, respectively (Malhotra & Majchrzak, 2012, 2014). As will be explained in Section 3 (Hypotheses Development), we expect IT-enabled task knowledge awareness and IT-enabled presence awareness to moderate the relationship between IT-enabled disclosure awareness and leadership behaviors (i.e. leadership styles and interpersonal helping).

2.2. Roles of directive/supportive leadership styles and interpersonal helping

Leadership and interpersonal helping are significant in shaping teamwork processes and outcomes (Bass, 1999; Carson, Tesluk, & Marrone, 2007; Podsakoff et al., 1996). This importance becomes even more pronounced in virtual teams as geographical dispersion is positively associated with anonymity, diffusion of responsibility, dehumanization and challenges in getting acquainted (Alnuaimi et al., 2010; Chidambaram & Tung, 2005; Cramton, 2001).

The leadership literature has examined the influence of various leadership styles (e.g., transactive, aversive, laissez-faire, supportive, directive) on work processes and outcomes (Bass, 1999; DeRue, Barnes, & Morgeson, 2010; Ensley, Hmieleski, & Pearce, 2006; Pearce & Sims, 2002). The present study focuses on directive and supportive leadership, given their critical roles in enabling team effectiveness (Ensley et al., 2006; Lorinkova, Pearsall, & Sims, 2013; Pearce & Sims, 2002; Pearce, Yoo, & Alavi, 2004).

The focus of directive leadership is to provide direction to other members, promoting a clear pathway of action (Pearce & Sims, 2002). It involves planning and initiation of structures, including providing instructions, objectives, how work should be done, and team members' roles (DeRue et al., 2010; Pearce & Sims, 2002). Directive leadership also includes the act of monitoring and managing members' behavior, explicit milestones and performance (DeRue et al., 2010). If a member fails to reach the assigned milestones, directive leadership involves highlighting the problems to the member (DeRue et al., 2010). Goal-setting theory (Locke & Latham, 1990) suggests that clear goals channel an individual's actions toward achieving those goals and may thus be useful in reducing ambiguities that rife in electronic communications (Chidambaram & Tung, 2005; Cramton, 2001).

Supportive leadership is considered an effective form of leadership (Wendt, Euwema, & van Emmerik, 2009) and entails creating a psychologically supportive and friendly work environment (House, 1996; Wendt et al., 2009). It involves consideration of other's needs, sensitivity to other's preferences and concern for other's well-being. It also comprises conflict resolution, offering positive communications and encouraging team members to articulate their opinions during a decision-making process, all of which are particularly important for fostering cohesiveness and harmonious working relations between the members (House, 1996; Wendt et al., 2009).

Interpersonal helping involves extra-role behaviors or prosocial behaviors that are performed voluntarily by employees, that are not mandated by organizations and have no expectations of rewards (Podsakoff et al., 1996). An example is a team member voluntarily staying after working hours to help out another member (Podsakoff, Mackenzie, Paine, & Bachrach, 2000; Venkataramani & Dalal, 2007). A substantial number of studies have indicated that interpersonal helping increases productivity, trust and task performance (Podsakoff et al., 2000). Investigations into determinants of helping include behaviors of formal leaders (Podsakoff et al., 1996), perceived fairness, and affective commitment (Podsakoff et al., 1996, 2000).

3. Hypotheses development

Our research draws upon leadership and awareness literature as the foundation for developing our model of IT-enabled awareness and leadership behaviors. Fig. 1 summarizes the relationships examined in this study. Below, we first focus on the relationship between IT-enabled disclosure awareness and leadership behaviors, highlighting the importance of the former in encouraging the latter. However, it is vital for virtual team members to not only exhibit leadership behaviors, but also regulate such behaviors to facilitate the integration of actions with other members (Millikin, Hom, & Manz, 2010; Rico et al., 2008). Thus, our model incorporates the moderating influences of IT-enabled task knowledge awareness and IT-enabled presence awareness on the relationship between IT-enabled disclosure awareness and leadership behaviors. One noteworthy aspect of the model is that all variables are at the
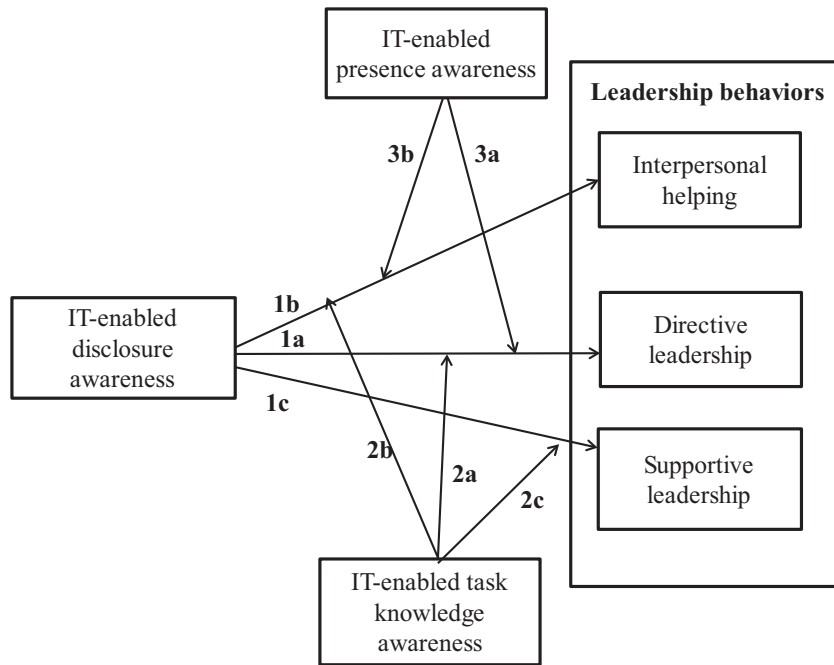
Fig. 1. Research model.

individual level and are based on self-perceptions, given that this study is driven by the need to understand what motivates individual virtual team members to self-direct their leadership behavior.

3.1. Impact of perceived disclosure awareness as enabled by ITs

Self-disclosure has been established as an important mechanism in facilitating liking in face-to-face interpersonal relations (Berger & Calabrese, 1975). Self-disclosure refers to the sharing of personal information about oneself. In technology-mediated settings, the role of self-disclosure has been examined predominantly in non-task contexts, such as get-know each other exercises (Antheunis, Schouten, Valkenburg, & Peter, 2012), friendship (Collins & Miller, 1994), intimacy (Collins & Miller, 1994) and online dating websites (Gibbs, Ellison, & Lai, 2011). Only a few studies emerge to examine the role of self-disclosure in a virtual team or an online task setting (e.g., Chiu & Staples, 2013; Moore et al., 1999).

Instead of probing the impact of self-disclosure, this study introduces the concept of disclosure awareness, i.e. the extent to which an individual team member knows the personal information about his or her team. By examining disclosure awareness, we believe that a more precise understanding regarding the impact of disclosure information can be obtained. Consider the following scenario: a team member may have self-disclosed to a large degree, but a communication partner may not have paid attention to the information; thus, the awareness that one obtains regarding the disclosure content is minimal. As a result, an examination of the impact of self-disclosure is inaccurate. Nonetheless, the self-disclosure literature provides valuable insights for formulating our arguments regarding the role of IT-enabled disclosure awareness.

ITs support disclosure awareness by enabling recipients or an authorized third-party to exchange and receive updated personal information. There are three types of IT-supported techniques that enable disclosure awareness: passive, active and interactive (Antheunis et al., 2012; Berger & Calabrese, 1975). Passive techniques involve a communicator observing his or her communication partners in a discreet manner. For example, social networking sites (e.g., Facebook) provide profiling capabilities that allow users to reveal personal information, such as education, relationship status, feelings and photos, and visibility management (Antheunis et al., 2012; Chiu & Staples, 2013). Posted messages on walls also allow one to attain information (Leonardi, 2015) related to disclosure, even if the messages are directed at others.

Active techniques are proactive oriented, which involve a member asking his or her communication partners through others (Berger & Calabrese, 1975). For example, a team member may ask about personal-related information of others through another person during online communication. Interactive techniques involve communication partners directly communicating with one another instead of indirectly, as in the case of active techniques (Berger & Calabrese, 1975). For example, Nardi, Whittaker, and Bradner (2000) found that individuals using instant messaging exchanged greeting even though the aim was not to exchange information. Interactive techniques translate to reciprocal disclosure, whereby self-disclosure by a team member motivates others to disclose, leading to a spiral of disclosures that result in liking (Collins & Miller, 1994; Moore et al., 1999).

Two theoretical lenses offer explanations behind the positive relationship between self-disclosure and liking (Collins & Miller, 1994). Social penetration theory, the first lens, states that self-disclosure is a form of social exchange or a rewarding outcome (Altman

& Taylor, 1973). The extent of self-disclosure is considered by recipients of self-disclosure as a measure of closeness. Self-disclosure is considered a rewarding outcome because it is deemed a signal by recipients to communicate one's fondness and a desire to develop a closer relationship. This contention is consistent with social exchange theories, which purport that individuals provided with more rewarding outcomes are viewed as more attractive. Information processing models of attraction, the second lens, indicate that liking people stems from positive impressions regarding those people (Ajzen, 1977). Compared to people who are less open in disclosing personal information, recipients who are more open are viewed more favorably (more trusting, friendly and warm) (Collins & Miller, 1994).

We argue that perceived IT-enabled disclosure awareness will motivate virtual team members to exhibit leadership behaviors (Manz & Sims, 1980; Stewart et al., 2011). Self-disclosure enhances familiarity, reducing uncertainties regarding one's partners (Antheunis et al., 2012) and facilitating conversations (Rockett & Okhuysen, 2002). For example, Moore et al. (1999) found that self-disclosure facilitated negotiators to interpret each other's actions and motivations in a more favorable light, enabling mutual agreement. In a virtual team setting, self-disclosure reduces the formation of geographical faultlines that give rise to conflict and mistrust (Chiu & Staples, 2013). A laboratory experimental study shows that exposing virtual team members to profiles that emphasize similarities between teammates reduces conflict and enhances team effectiveness (Windeler, Maruping, Robert, & Riemenschneider, 2015). Also, various studies have revealed that self-disclosure contributes to liking, intimacy and positive perceptions (Collins & Miller, 1994). Interpersonal relationships, increased familiarity and liking are central to trust development and information sharing (Dirks, 1999; Gruenfeld, Mannix, Williams, & Neale, 1996; Rockett & Okhuysen, 2002). Scholars have asserted that interpersonal relationships, liking and trust promote one's desire to sustain ongoing relationships and self-influence, inducing team members to engage in acts of cooperation and open exchanges of information, and to direct efforts toward the collective task (Dirks, 1999; Millikin et al., 2010; Rico et al., 2008; Zaccaro et al., 2001). The motivation to exert energy for the team is derived in part from relational elements (Zaccaro et al., 2001). Thus, virtual team members who perceive disclosure awareness will be more likely to exercise leadership behaviors, such as directive and supportive leadership styles, that facilitate joint work activities. Moreover, liking and interpersonal relationships motivate individuals to become self-starters and help their teammates, as they believe their teammates will reciprocate and will not take advantage of them (Millikin et al., 2010; Zaccaro et al., 2001). Based on the above discussion, we expect that:

Hypothesis 1. *Perceived disclosure awareness enabled by ITs is positively associated with* (*a*) *directive leadership;* (*b*) *interpersonal helping; and* (*c*) *supportive leadership.*

3.2. Moderating impact of perceived task knowledge awareness as enabled by ITs

IT-enabled task knowledge awareness refers to "up-to-minute knowledge of who is doing what in the team to facilitate performance of the team's task in ways that affect each member's work" (cf. Espinosa et al., 2007, Malhotra & Majchrzak, 2014, p. 393). IT-enabled task knowledge awareness indicates that team members hold understandings with respect to the task environment, such as responsibilities and work progress of others in the team (Malhotra & Majchrzak, 2014). The IT features that are used to develop IT-enabled task knowledge awareness are distinct from the ones used for facilitating IT-enabled presence awareness (Malhotra & Majchrzak, 2012, 2014). Malhotra and Majchrzak (2012) found that the IT features for developing IT-enabled task knowledge awareness include repositories, electronic annotation, commenting features and the capability to compare objects, such as documents. Many of these IT features are embedded across various social media tools, such as Google Docs, Google Sheets and Facebook.

Although we suggest that perceived IT-enabled disclosure awareness is positively associated with directive/supportive leadership and interpersonal helping, perceived task knowledge awareness supported by ITs may moderate this relationship. When IT-enabled disclosure awareness exists and if team members perceive high IT-enabled task knowledge awareness, they are less likely to employ directive leadership and interpersonal helping. We suggest that IT-enabled task knowledge awareness is a substitute for directive leadership. The substitutes of leadership approach suggest that different situational elements can replace the need for certain leadership behaviors such that engaging in the leadership behaviors is rendered redundant (Kerr & Jermier, 1978). For example, formalization of the organization (explicit goals, plans and areas of responsibility) and an unambiguous task will render task-oriented leadership less necessary (Kerr & Jermier, 1978). When a team member perceives he is informed about the task environment (i.e. high IT-enabled task knowledge awareness), he is likely to reduce directive leadership, which involves pre-establishing expectations and guidelines for the task to proceed even though IT-enabled disclosure awareness spurs him to do so. Conversely, when a team member perceives a lack of understanding regarding the task environment (i.e. low IT-enabled task knowledge awareness), it necessitates providing explicit milestones, rules, and other task details that characterize directive leadership (DeRue et al., 2010; Lorinkova et al., 2013). The adherence to such details mitigates uncertainties and ambiguities (DeRue et al., 2010).

Members who like their teammates engage in integrative actions that consider their teammate's actions and the team's goals (Millikin et al., 2010; Zaccaro et al., 2001). They self-manage their own behaviors such that they can synchronize their teammates' actions with theirs, and they rely on their teammates when necessary, facilitating coordination for collective work (Dirks, 1999; Millikin et al., 2010). In contrast, the lack of interpersonal relationships with and liking for one's teammates tend to promote individualistic actions that are independent of the team's needs (Dirks, 1999; Millikin et al., 2010). Thus, for a team member who perceives IT-enabled disclosure awareness, he or she is likely to exercise directive leadership to cope with the ambiguous task environment for low perceived IT-enabled task knowledge awareness, but *reduce directive leadership for high perceived IT-enabled task knowledge awareness*.

Hypothesis 2a. *There is a positive association between perceived disclosure awareness enabled by ITs and directive leadership at low levels of perceived task knowledge awareness enabled by ITs, but a negative association at high levels of perceived task knowledge awareness enabled by ITs.*

The line of logic used for directive leadership can also be applied to interpersonal helping. With IT-enabled task knowledge awareness, team members know the progress of other's work and how other's goals and work relate to the overall task (Cronin & Weingart, 2013; Malhotra & Majchrzak, 2014). Although team members who perceived IT-enabled disclosure awareness are motivated to go the extra mile to help other members, IT-enabled task knowledge awareness suggests that helping is less needed. Hence, they are likely to reduce their interpersonal helping. Podsakoff et al. (1996) suggest that when organizational tasks are routine, such as having formal rules and procedures in place, employees do not perceive the need to engage in extra-role behaviors. Contrariwise, if team members are unclear about work plans or how others' activities fit in with accomplishing the task, coordination is impeded (Malhotra & Majchrzak, 2014; Rico et al., 2008). As argued, IT-enabled disclosure awareness is likely to encourage team members to adjust their actions in pursuit of integrative actions with their team. Taken together, we expect that the lack of perceived IT-enabled task knowledge awareness is likely to spur team members who perceive IT-enabled disclosure awareness to exercise interpersonal helping to facilitate joint work activities.

Hypothesis 2b. *There is a positive association between perceived disclosure awareness enabled by ITs and interpersonal helping at low levels of perceived task knowledge awareness enabled by ITs, but a negative association at high levels of perceived task knowledge awareness enabled by ITs.*

On the other hand, it is also possible that the positive IT-enabled disclosure awareness effect on supportive leadership is strengthened when IT-enabled task knowledge awareness increases. In other words, IT-enabled task knowledge awareness supplements IT-enabled disclosure awareness in enhancing supportive leadership. As we recall, IT-enabled task knowledge awareness involves knowing the "evolution of knowledge", which equips one with a fundamental understanding to consider suggestions and enables individuals to present various opinions (Malhotra & Majchrzak, 2014). Team members may have alternative perspectives on establishing milestones, how to divide the tasks, time pacing and other work activities (Cronin & Weingart, 2013). If distinct perspectives are not reconciled, it will translate into conflict that is detrimental to a team (Cronin & Weingart, 2013). Recall from the earlier discussion that perceived IT-enabled disclosure awareness induces liking and interpersonal relationships, encouraging team members to exercise supportive leadership so as to achieve integrative actions and effective teamwork. Indeed, supportive leadership emphasizes developing and maintaining a friendly and harmonious work environment (House, 1996; Wendt et al., 2009). As perceived IT-enabled task knowledge awareness increases, team members who perceive IT-enabled disclosure awareness will likely intensify supportive leadership, which includes encouraging team members to voice their opinions during the decision-making process, accounting for team members' preferences and sensitivity toward tensions, all of which enable conflict resolution (Wendt et al., 2009). Based on the above discussion, we expect that:

Hypothesis 2c. *The positive association between perceived disclosure awareness enabled by ITs and supportive leadership is enhanced at high levels of perceived task knowledge awareness enabled by ITs.*

3.3. Moderating impact of perceived presence awareness as enabled by ITs

IT-enabled presence awareness refers to "up to the minute knowledge of which team members are around, where and when, as relevant for the task"(cf. Espinosa et al., 2007; Malhotra & Majchrzak, 2014, p. 141). IT-enabled presence awareness conveys a sense that individuals are accessible and are available to engage with one another (Malhotra & Majchrzak, 2014). When team members are distributed, it necessitates the members to be reachable online so that spontaneous communication can be carried out, akin to collocated team members (Malhotra & Majchrzak, 2014). IT features that are used to facilitate presence awareness include application sharing, electronic whiteboards and instant messaging (Malhotra & Majchrzak, 2012, 2014). Akin to IT-enabled task knowledge awareness, many of these IT features are embedded across various social media tools such as Google Docs, Google Sheets and Facebook.

We argue that IT-enabled presence awareness may moderate the positive relationship between IT-enabled disclosure awareness and directive leadership and interpersonal helping. IT-enabled presence awareness provides a mechanism that one can employ to extend directive leadership and interpersonal helping. Lacking IT-enabled presence awareness, team members may perceive their communication facilities to be severely diminished. Recall that earlier, we have argued that perceived IT-enabled disclosure awareness results in liking and interpersonal relationships and thus encourages directive leadership and interpersonal helping, which are important for collective coordination. The lack of online accessibility and reachability, however, creates work disruptions among distributed team members, as members are not able to rapidly seek clarifications and feedback (Malhotra & Majchrzak, 2014), enhancing the likelihood of process losses, such as relational conflict, coordination difficulties and misinterpretations (Alnuaimi et al., 2010; Cramton, 2001; Malhotra & Majchrzak, 2012, 2014) which is detrimental to interpersonal relationships and trust building. As a result, despite perceived IT-enabled disclosure awareness, team members are likely to reduce directive leadership and interpersonal helping when there is low IT-enabled presence awareness. In contrast, being able to carry out impromptu communication, distributed team members who perceive IT-enabled presence awareness are able to reach out to others (Malhotra & Majchrzak, 2014) and, thus, monitor whether expectations or instructions have been met, as well as offer assistance whenever the

need arises, thus maintaining the positive relationship between IT-enabled disclosure awareness with directive leadership and interpersonal helping. The above discussion is surmised as:

Hypothesis 3a. *There is a positive association between perceived IT-enabled disclosure awareness enabled by ITs and directive leadership at high levels of perceived IT-enabled presence awareness enabled by ITs, but a negative association at low levels of perceived presence awareness enabled by ITs.*

Hypothesis 3b. *There is a positive association between perceived disclosure awareness enabled by ITs and interpersonal helping at high levels of perceived presence awareness enabled by ITs, but a negative association at low levels of perceived presence awareness enabled by ITs.*

In contrast, the moderating effect of IT-enabled presence awareness on the link between IT-enabled disclosure awareness and supportive leadership is ambiguous. As described, supportive leadership is invoked to develop a psychologically supportive working environment and to reconcile distinct perspectives. Supportive leadership, which involves displaying concern for one another and facilitating conflict resolution, may be performed via asynchronous ITs and not necessarily through the pathway of IT-enabled presence awareness. In contrast, directive leadership and interpersonal helping, which encompass monitoring and going the extra mile, respectively, are significantly more difficult to perform via asynchronous ITs, which require senders to wait for message responses that may not occur (Cramton, 2001).

4. Research methodology

We adopted a field study methodology, as this type of methodology enables more empirical realism than laboratory experiments involving self-disclosure (e.g., Chiu & Staples, 2013; Windeler et al., 2015). In addition, we employed students as our participants because a meta-analysis reveals that student work teams are a reasonable setting to test leadership-associated phenomena (D'Innocenzo et al., 2016). Similar to many distributed ad-hoc organizational task groups, the teams in our sample: (a) had the latitude to select ITs for collaboration as well as define, monitor and organize their work activities; (b) were assigned a decision-making project that had a deadline; (c) were temporary and ad-hoc in nature; and (d) communicated mainly via ITs for task collaboration (as will be elaborated below). Given the prevalence of innovative digital products and services, the assigned project is of great relevance to students and is one which they should be motivated and able to accomplish.

4.1. Sample

The participants in this study were first year business graduate students enrolled in a Management of Information Systems course at a business college. The business college has different campuses distributed geographically. All 146 students were randomly formed into mixed-gender teams comprising six to seven members and were distributed across three geographical locations (in the same country) to work on a team project. There were at least two team members in each location. The students were in their first semester and attended all their courses in their respective campus. Class attendance was mandatory. The students had courses at their campus every week and had a heavy workload as is typical for students in their first year in this college. It is thus unlikely that geographically dispersed team members knew one another prior to the project, or that the entire team met each other face-to-face. As will be further described, data related to familiarity and face-to-face interactions were collected. There were 22 teams. The teams were given three weeks to complete their project, which was part of their course requirement.

Participation in the study—defined as completing the surveys associated with this study—was voluntary. Given that not all the students chose to participate in the study, we chose teams with > 50% participation to ensure adequate analysis (Babbie, 2007). The sample consisted of 19 teams, and the participation rate was 64.38% (94 respondents). The participation distribution was as follows: 1 team (7 participants), 3 teams (6 participants), 9 teams (5 participants) and 6 teams (4 participants). The participants were distributed across the three geographical locations. Approximately 60.63% of the participants were women, 95.74% of the participants had some working experience, and all the participants were in the age range of 21 to 25.

4.2. Task

As part of the course requirement, all teams were required to complete a project and give an oral presentation. The project—"Digital Innovation"—entailed the teams to research and find a digital company that generates innovative products/services. The teams were required: (a) to identify and discuss phenomenon related to digital innovations (e.g., sustainability of the innovations); (b) submit a report stating the ITs used in their task collaboration and the lessons learnt from working in a virtual team setting.

4.3. Procedure

Participants of the study earned extra credit toward their Management of Information Systems course. Prior to the project, participants completed an online survey that measured demographic variables (e.g., gender and age). Prior to survey completion, participants were asked to complete the surveys candidly and were informed that their responses would not impact their course grade. Upon completion of the project and prior to receiving their grades, participants were asked to complete an online survey that measured the variables of interest. Participants received their project grade at the same time as non-participants. Non-participants

were given an alternative optional writing assignment for extra credit. None of the non-participants accepted this optional writing assignment.

Interestingly, all teams indicated in their submitted report that they used mainly social media to perform their task collaboration because they could not meet their remote team members for face-to-face discussions. As all teams were informed about who their members were via email, they employed email as their first point of communication. Subsequently, they searched for their partners on Facebook and turned to various social media tools (e.g., Facebook, Google Docs, Skype) for their task collaboration. They also noted that they established a private group comprising only their team members on Facebook. Various teams also indicated that they employed Facebook to chat, to network socially with and to know each other personally, reflecting the importance of Facebook in fostering IT-enabled disclosure awareness.

4.4. Measures

All measures were rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) and were self-reported. Appendix A presents the items of the measures along with the reliabilities. The items were adapted by changing the wording to reflect the context of a team project. As the unit of analysis is individual, the individual is used as the referent for all measures (Chan, 1998).

Appendix A
(Survey instruments).

Construct	Item	Reliabilities
IT-enabled disclosure awareness	1. The technology used by this team enables me to know about the personal social details (real name, age, gender, photos showing you, home address, relationship status) of my team members. 2. The technology used by this team enables me to know about the personal expertise details (e.g., skills, talents, degree, expertise, certificates earned, prior working experience) of my team members. 3. The technology used by this team enables me to know about the personal views and opinions (political views, religious views) of my team members. 4. The technology used by this team enables me to know about the moods and feelings of my team members.	0.80
IT-enabled task knowledge awareness	1. The technology used by this team enables me to contribute knowledge to the team repository (a place that stores and managed documents. E.g., Google Docs) in a draft-like form. 2. The technology used by this team enables me to keep track of the changes over time in any document in the team repository. 3. The technology used by this team enables me to link different entities because they share a similar subject or purpose. 4. The technology used by this team enables me to compare different pieces of knowledge in the team repository.	0.80
IT-enabled presence awareness	1. The technology used by this team enables me to feel as if I am in the same location as the other members in this team (even when they are not in the same location). 2. The technology used by this team enables me to easily call for impromptu communication between members. 3. The technology used by this team enables me to engage in synchronous interactions with other members of this team in a similar way that I would have interacted if we were face-to-face.	0.79
Directive leadership	1. I made most decisions for team members in this project. 2. I had to lay out goals and guidelines, otherwise members of this team will be passive and get nothing accomplished. 3. I expected members in this team to follow my instructions precisely. 4. I motivated members in this team by letting them know what will happen to them if their work was unsatisfactory. 5. I "supervised" team members very closely. 6. I required members in this team to submit reports of their assigned work. 7. I made most decisions for team members in this project.	0.88
Supportive leadership	1. I worked to develop close personal relationships with members in this team. 2. I frequently demonstrated concern for members in this team. 3. I believed team members' feelings were as important as the task on hand. 4. I relied on what I've learn through personal contact with team members to use each person's talent most effectively. 5. I worked hard to ease tensions whenever they arise in this team. 6. I encouraged team members to talk to him/her about personal problems.	0.81
Interpersonal helping	1. I helped others in this team when it is clear their workload was too high. 2. I took the initiative to help orient others in this team to this project even though it was not required. 3. I lent a helping hand to others in this team when needed.	0.77

All measures were rated on a 5-point Likert scale ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree").

Table 1
Factor structure of awareness forms enabled by ITs.

Scale items[b]	Principal component with promax rotations[a]		
	Factor 1 (IT-DA)	Factor 2 (IT-TKA)	Factor 3 (IT-PA)
IT-DA1	0.62		
IT-DA2	0.74		
IT-DA3	0.83		
IT-DA4	0.82		
IT-TKA1		0.74	
IT-TKA2		0.77	
IT-TKA3		0.77	
IT-TKA4		0.80	
IT-PA1			0.79
IT-PA2			0.79
IT-PA3			0.79
Eigenvalues	4.63	1.69	0.99[c]
Percentage of variance explained	42.08	15.36	9.00
Cumulative percentage	42.08	57.43	66.43

[a] Suppress absolute values < 0.40.

[b] IT-DA: IT-enabled disclosure awareness; IT-TKA: IT-enabled task knowledge awareness; IT-PA: IT-enabled presence awareness.

[c] Kaiser's (1960) eigenvalue greater than one rule is commonly deemed as dubious (Courtney, 2013). It is not reasonable to assume that an eigenvalue of 0.99 is trivial while an eigenvalue of 1.01 is significant (Courtney, 2013).

4.4.1. IT-enabled disclosure awareness

We developed a measure of IT-enabled disclosure awareness for this study. It comprises four items based on self-disclosure conceptualizations examined in a non-task setting (Shibchurn & Yan, 2015).[1] Cronbach's α was 0.80, exceeding the recommended value of 0.70.

4.4.2. IT-enabled task knowledge awareness

We used a four-item scale to measure IT-enabled task knowledge awareness (Malhotra & Majchrzak, 2014). Cronbach's α was 0.80.

4.4.3. IT-enabled presence awareness

We used a three-item scale to measure IT-enabled presence awareness (Malhotra & Majchrzak, 2014). Cronbach's α was 0.79. Principle-component factor analysis with a Promax rotation was performed on the three situational awareness variables to assess if participants could distinguish them as conceptually different. All the items loaded on each required factor, and the factor loadings were well above 0.40 (the smallest value is 0.62). 66.43% of the cumulative variance was accounted for by the factors. These results show that respondents were able to distinguish the situational awareness variables as three distinct constructs. Table 1 presents the results of principle-component factor analysis for the three awareness constructs.

We did not measure the actual use of IT features by participants, as various scholars have noted that individuals may adapt and use ITs differently (Fulk, 1993; Malhotra & Majchrzak, 2014). Following recent work (Majchrzak, Malhotra, & John, 2005; Malhotra & Majchrzak, 2014), we measured the extent to which IT enables each form of situational awareness from each team member's perspective.

4.4.4. Directive/supportive leadership

We measured directive and supportive leadership based on items adapted from Litwin and Stringer (1968), documented in Hay/McBer (2000) and Euwema, Wendt, and Van Emmerik, (2007). These items have been used in other research (Euwema et al., 2007; Houldsworth & Jirasinghe, 2006; Wendt et al., 2009). Cronbach's α for directive and supportive leadership were 0.88 and 0.81, respectively.

4.4.5. Interpersonal helping

Three items drawn from Den Hartog, De Hoogh, and Keegan (2007)'s scale and developed from prior research (Podsakoff, MacKenzie, Moorman, & Fetter, 1990) were used to measure interpersonal helping. Cronbach's α was 0.77. Principle-component analysis was performed on directive leadership, supportive leadership and interpersonal helping. The overall variance accounted for by the factors was 59.58%. The relevant items loaded on each factor, and all item loadings were > 0.40, indicating that the three factors were conceptually distinct from each other. Table 2 presents the results of principle-component factor analysis for the three leadership behavior factors.

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[1] 3 ("The technology used by this team enables me to know about the personal views and opinions (political views, religious views) of my team members.") is a different question type than other disclosure awareness questions and is hence inappropriate to include the item. However, dropping the item did not affect the results that will be presented in the subsequent section.

Table 2
Factor structure of leadership behaviors.

Scale items[b]	Principal component with promax rotations[a]		
	Factor 1 (DL)	Factor 2 (SL)	Factor 3 (IH)
DL1	0.67		
DL2	0.67		
DL3	0.72		
DL4	0.88		
DL5	0.66		
DL6	0.88		
DL7	0.63		
SL1		0.44	
SL2		0.71	
SL3		0.83	
SL4		0.74	
SL5		0.66	
SL6		0.73	
IH1			0.75
IH2			0.73
IH3			0.86
Eigenvalues	6.23	1.95	1.35
Percentage of variance explained	38.95	12.18	8.45
Cumulative percentage	38.95	51.12	59.58

[a] Supress absolute values < 0.40.
[b] DL: directive leadership; SL: supportive leadership; IH: interpersonal helping.

4.4.6. Control variables

To account for potential alternative explanations, we included the following control variables: familiarity with each team member prior to the assigned project (Gruenfeld et al., 1996) and the extent of face-to-face communication among collocated team members (i.e. team members located in the same geographical location). Familiarity and face-to-face communication were included because they enhance relational development (Malhotra & Majchrzak, 2014) and may reduce the need to gain awareness via ITs. We used the established scale of Gruenfeld et al. (1996) to measure familiarity. Each team member rated another member in terms of familiarity. We computed an aggregate of familiarity for each team member.

5. Findings

Given that our sample comprises individuals nested within groups, we assessed for possible grouping effects on each dependent variable prior to testing our hypotheses. If there were significant grouping effects, it is important to account for the group effects, and Hierarchical Level Modeling (HLM) should be used to test the hypotheses. We used a hierarchical null model and computed the intraclass correlation (ICC) of all dependent variables. The results show that the ICCs are close to zero (directive leadership: $\rho = 0.04$; supportive leadership: $\rho = 0.03$ and interpersonal helping: $\rho = 0.04$). Hence, it is unnecessary to use HLM for the analysis.[2]

All measures are self-reported given our theoretical focus on understanding how virtual team members self-direct their leadership behaviors. Nevertheless, the results may still be attributed to common method bias. We employed two methods to determine if common method bias exists. The first method, Harmon's one factor test, shows that 29.89% of variance is accounted for by a single factor, indicating that no dominant factor accounts for the majority of the variance; hence, no common method bias exists. The second method assesses the presence of interaction effects. In a Monte Carol study, Evans (1985) found that "artifactual interactions cannot be created…. True interactions can be attenuated." (p. 305). In other words, if the subsequent analyses were to demonstrate interaction effects, the results are unlikely due to common method bias. We proceeded to test the hypotheses.

5.1. Hypotheses testing

Table 3 presents the means, standard deviations and correlation matrix of the variables of interest.

We used ordinary least squares (OLS) regression with standardized control and independent variables (Aiken & West, 1991) to test the hypothesized effects. All variables were standardized to reduce potential multicollinearity and to enable interpretation of regression coefficients. In step 1, the control variables were entered. In step 2, IT-enabled disclosure awareness, IT-enabled task knowledge awareness and IT-enabled presence awareness were entered (to test the independent main effects of the awareness

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[2] Some scholars suggest that if the ICC is < 0.05, it is unnecessary to perform multilevel modeling. Nevertheless, we reran the below analysis using multilevel modeling. The conclusions were the same except that for moderator values (high IT-enabled task knowledge awareness and low IT-enabled presence awareness), the slopes were significant outside the ± 1 standard deviation range. For example, the negative slope between IT-enabled disclosure awareness and interpersonal helping was significant for IT-enabled presence awareness values < 1.7 standard deviation below the mean of IT-enabled presence awareness. As Preacher, Curran, and Bauer (2006) noted, the values of ± 1 standard deviation were arbitrary.

Table 3

Correlations and descriptive statistics for key study variables.

	M	SD	1	2	3	4	5	6	7	8
1. IT-enabled disclosure awareness	3.26	0.79	–							
2. IT-enabled task knowledge awareness	3.71	0.70	0.38**	–						
3. IT-enabled presence awareness	3.55	0.84	0.48**	0.56**	–					
4. Directive leadership	3.12	0.75	0.37**	0.15[+]	0.12	–				
5. Supportive leadership	3.26	0.66	0.51**	0.42**	0.34**	0.49**	–			
6. Interpersonal helping	3.72	0.62	0.27**	0.23*	0.21*	0.52**	0.39**	–		
7. Face-to-face	3.48	1.13	0.36**	0.40**	0.38**	0.19*	0.19*	0.27**	–	
8. Familiarity	1.79	0.66	0.24*	0.01	0.08	0.12	0.37**	0.03	−0.03	–

n = 94 (number of teams = 19).

[+] $p < .10$.

[*] $p < .05$.

[**] $p < .01$.

variables). In step 3, all the interaction terms of interest were entered to test the moderating effects. The interaction terms are computed from the standardized data. Also, we checked for undue influence from any cases and multicollinearity among the variables. It is typical for 95% of the cases to have standardized residuals less than or > 2 and 99% of the cases to be within ± 2 (Field, 2013). The analysis shows that 95% of the cases (i.e. 5 out of 94 cases) have standardized residuals less than or > 2 and 99% of the cases (i.e. 93 cases) lie within ± 2.5. There are no standardized residuals that go beyond 3. Cook's distances are below 1. These results show that there is no excessive impact caused by any of the cases. Also, all variance inflation factor (VIF) values range from 1.08 to 4.40 and are thus well lower than 10 (see Table 4), indicating no multicollinearity issues in the predictor estimates.

Table 4 shows the results of the regression analyses. The table presents the standardized coefficients, standard error, adjusted R^2, the F value, the change in adjusted R^2 and the associated significance.

5.1.1. Main impact of IT-enabled disclosure awareness

IT-enabled disclosure awareness is positively related to directive leadership (β = 0.37; $p < .01$) and supportive leadership (β = 0.34; $p < .01$) and is marginally positively associated with interpersonal helping (β = 0.18; $p < .10$). Therefore, Hypothesis 1 is largely supported.

Below, we analyze the moderating effects of IT-enabled task knowledge awareness and IT-enabled presence awareness on the relationship between IT-enabled disclosure awareness and the focal outcome. If interaction effects exist, we plotted graphs one standard deviation above and below the mean of the moderating variable, performed slope analysis (Aiken & West, 1991) and probed into the regions of significance (Preacher et al., 2006). The regions of significance indicate the range of values for the moderating variable at which the slope between IT-enabled disclosure awareness and the focal outcome is significant, thus offering a more nuanced understanding of slope analysis (Preacher et al., 2006).

5.1.2. Moderation by IT-enabled task knowledge awareness

There is an interaction effect between IT-enabled disclosure awareness and IT-enabled task knowledge awareness on directive leadership (β = −0.57; $p < .01$) and interpersonal helping (β = −0.78; $p < .01$). Fig. 2a and b present the nature of the interaction for the dependent variables—directive leadership and interpersonal helping—respectively. Fig. 2a and the slope analysis show that the relationship between IT-enabled disclosure awareness and directive leadership is positive for low IT-enabled task knowledge awareness (β = 0.91; $p < .01$) and negative for high IT-enabled task knowledge awareness (β = −0.23; $p = .045$). In addition, we examined the regions of significance, which indicate the range of IT-enabled task knowledge awareness values at which the relationship between IT-enabled disclosure awareness and directive leadership is significant. The results show that IT-enabled disclosure awareness is significantly associated with directive leadership for IT-enabled task knowledge awareness values that fall outside the region (0.31, 0.99) standard deviations below and above the mean of IT-enabled task knowledge awareness, respectively. Taken together, these results indicate that (a) for IT-enabled task knowledge awareness values less than a 0.31 standard deviation below the mean of IT-enabled task knowledge awareness, IT-enabled disclosure awareness is positively associated with directive leadership; (b) for IT-enabled task knowledge awareness values greater than a 0.99 standard deviation above the mean of IT-enabled task knowledge awareness, IT-enabled disclosure awareness is negatively associated with directive leadership. Thus, Hypothesis 2a is supported.

Fig. 2b shows a positive relationship between IT-enabled disclosure awareness and interpersonal helping for low IT-enabled task knowledge awareness (β = 0.90; $p < .01$) and a negative relationship for high IT-enabled task knowledge awareness (β = −0.66; $p < .01$). Next, we analyzed the regions of significance. The results show that IT-enabled disclosure awareness is significantly associated with interpersonal helping for IT-enabled task knowledge awareness values that fall outside the region (−0.03, 0.34) standard deviations below and above the mean of IT-enabled task knowledge awareness, respectively. Taken together, these results indicate that (a) for IT-enabled task knowledge awareness values less than a − 0.03 standard deviation below the mean of IT-enabled task knowledge awareness, IT-enabled disclosure awareness is positively associated with interpersonal helping; (b) for IT-enabled task knowledge awareness values greater than a 0.34 standard deviation above the mean of IT-enabled task knowledge awareness, IT-enabled disclosure awareness is negatively associated with interpersonal helping. Thus, Hypothesis 2b is supported.

Table 4

Hypotheses tests using regression.

Variable	Directive leadership							Supportive leadership							Interpersonal helping						
	Model 1		Model 2		Model 3			Model 1		Model 2		Model 3			Model 1		Model 2		Model 3		
	Std. coeff.	SE	Std. coeff.	SE	Std. coeff.	SE	VIF	Std. coeff.	SE	Std. coeff.	SE	Std. coeff.	SE	VIF	Std. coeff.	SE	Std. coeff.	SE	Std. coeff.	SE	VIF
Member familiarity	0.13	0.08	0.05	0.08	0.05	0.08	1.08	0.38	0.06	0.29**	0.06	0.29**	0.06	1.08	0.04	0.06	−0.01	0.06	−0.00	0.06	1.08
Face-to-face	0.20*	0.08	0.09	0.08	0.14+	0.08	1.35	0.20	0.06	−0.04	0.06	−0.04	0.06	1.33	0.27**	0.06	0.16+	0.07	0.24*	0.07	1.35
IT-enabled disclosure awareness			0.37**	0.09	0.34**	0.09	1.49			0.34**	0.07	0.34**	0.06	1.49			0.18+	0.08	0.12	0.07	1.49
IT-enabled task knowledge awareness			0.04	0.09	−0.08	0.10	1.85			0.31**	0.07	0.30**	0.07	1.73			0.09	0.08	−0.11	0.08	1.85
IT-enabled presence awareness			−0.12	0.10	0.01	0.10	1.96			−0.01	0.07	−0.01	0.07	1.70			0.02	0.08	0.14	0.08	1.96
IT-enabled task knowledge awareness * IT-enabled disclosure awareness					−0.57**	0.11	4.40					−0.05	0.07	1.20					−0.78**	0.07	4.40
IT-enabled presence awareness * IT-enabled disclosure awareness					0.54**	0.09	4.36												0.57**	0.09	4.36
Adjusted R^2	0.03		0.11		0.17			0.16		0.37		0.36			0.05		0.07		0.20		
ΔR^2			0.08		0.06					0.21		0.01					0.02		0.13		
F statistic	2.57*		3.22*		3.67**			1.02**		11.89**		9.87**			3.53*		2.29*		4.29**		
F change	2.57*		3.51**		4.23**			1.02**		1.95**		0.26			3.53*		1.43		8.34**		

Std. coeff.: standardized coefficient; SE: standard error; VIF: variance inflation factor.

n = 94 (number of teams = 19).

+ $p < .10$.
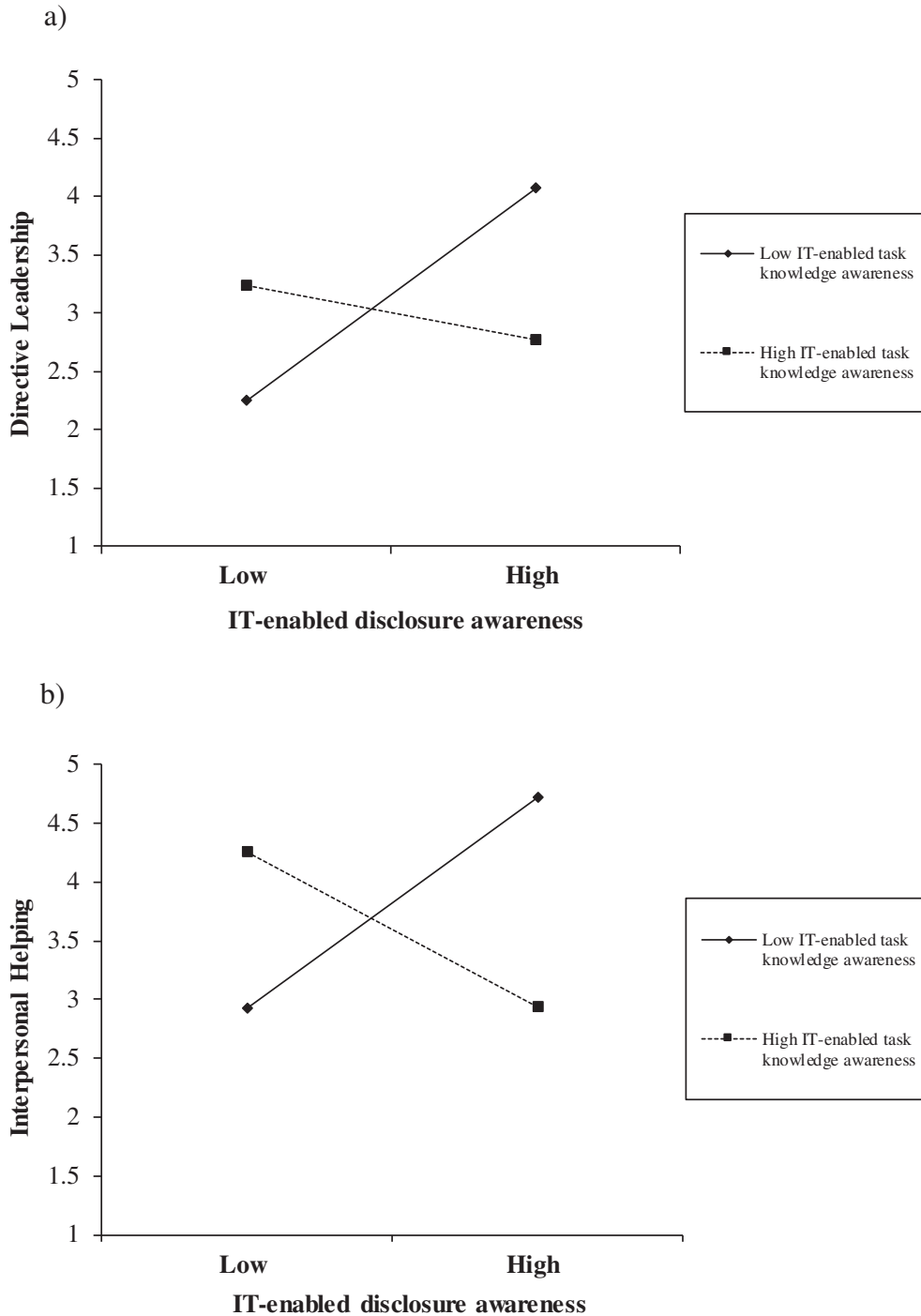
* $p < .05$.

** $p < .01$.

a)

b)

Fig. 2. a. Interaction effect between IT-enabled task knowledge awareness and IT-enabled disclosure awareness on directive leadership.
b. Interaction effect between IT-enabled task knowledge awareness and IT-enabled disclosure awareness on interpersonal helping.

Contrary to Hypothesis 2c, IT-enabled disclosure awareness did not interact with IT-enabled task knowledge awareness to impact supportive leadership ($\beta = -0.05$; p = ns). Instead, regardless of IT-enabled disclosure awareness, IT-enabled task knowledge awareness is positively linked with supportive leadership ($\beta = 0.30$; $p < .01$).

5.1.3. Moderation by IT-enabled presence awareness

There is an interaction effect between IT-enabled disclosure awareness and IT-enabled presence awareness on directive leadership
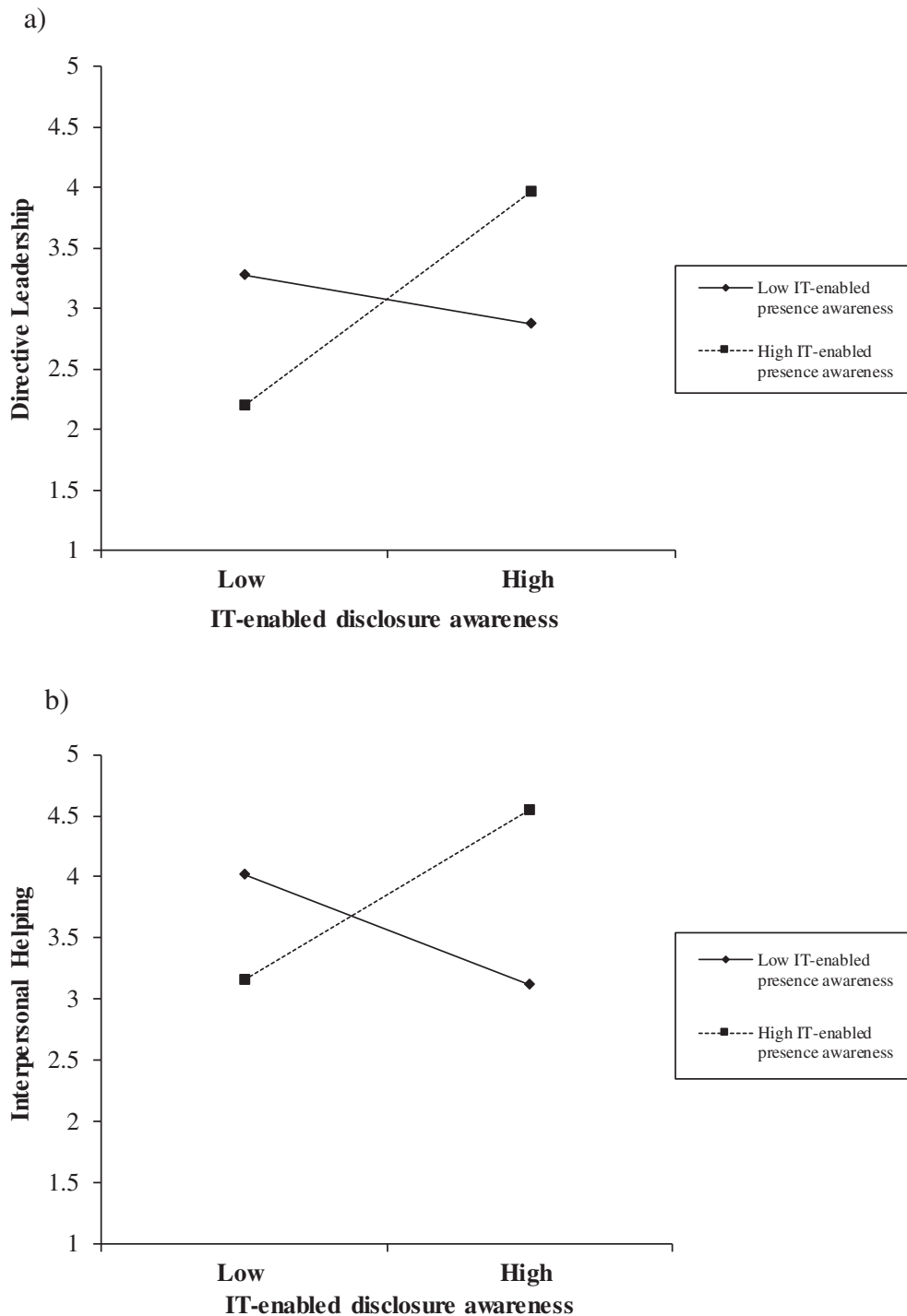
a)

b)

Fig. 3. a. Interaction effect between IT-enabled presence awareness and IT-enabled disclosure.
awareness on directive leadership.
b. Interaction effect between IT-enabled presence awareness and IT-enabled disclosure awareness on interpersonal helping.

($\beta = 0.54$; $p < .01$) and interpersonal helping ($\beta = 0.57$; $p < .01$). Fig. 3a and the slope analysis show that the relationship between IT-enabled disclosure awareness and directive leadership is positive for high IT-enabled presence awareness ($\beta = 0.88$; $p < .01$) and that a marginal negative relationship for low IT-enabled presence awareness exists ($\beta = -0.20$; $p < .10$). The relationship between IT-enabled disclosure awareness and directive leadership is significant for all values of IT-enabled presence awareness that fall outside the region (-1.12, -0.32) standard deviations below and above the mean of IT-enabled presence awareness, respectively. In

Table 5

Summary of hypotheses and results.

Hypotheses	Results
Hypothesis 1: perceived disclosure awareness enabled by ITs is positively associated with (a) directive leadership; (b) interpersonal helping; and (c) supportive leadership.	All are supported, except Hypothesis 1b (marginal significant).
Hypothesis 2a: there is a positive association between perceived disclosure awareness enabled by ITs and directive leadership at low levels of perceived task knowledge awareness enabled by ITs, but a negative association at high levels of perceived task knowledge awareness enabled by ITs.	Supported
Hypothesis 2b: there is a positive association between perceived disclosure awareness enabled by ITs and interpersonal helping at low levels of perceived task knowledge awareness enabled by ITs, but a negative association at high levels of perceived task knowledge awareness enabled by ITs.	Supported
Hypothesis 2c: the positive association between perceived disclosure awareness enabled by ITs and supportive leadership is enhanced at high levels of perceived task knowledge awareness enabled by ITs.	Not supported.
Hypothesis 3a: there is a positive association between perceived disclosure awareness enabled by ITs and directive leadership at high levels of perceived presence awareness enabled by ITs, but a negative association at low levels of perceived presence awareness enabled by ITs.	Supported
Hypothesis 3b: there is a positive association between perceived disclosure awareness enabled by ITs and interpersonal helping at high levels of perceived presence awareness enabled by ITs, but a negative association at low levels of perceived presence awareness enabled by ITs.	Supported

combination, these results show that (a) for IT-enabled presence awareness values less than a -1.12 standard deviation below the mean of IT-enabled presence awareness, IT-enabled disclosure awareness is negatively associated with directive leadership; (b) for IT-enabled presence awareness values greater than a -0.32 standard deviation above the mean of IT-enabled presence awareness, IT-enabled disclosure awareness is positively associated with directive leadership. The results of the region of significance are contrary to that indicated by the slope analysis. However, the slope analysis was performed ± 1 standard deviation from the mean of IT-enabled presence awareness, values that are arbitrary (Preacher et al., 2006). By setting the slope analysis to be performed 1.13 standard deviation below the mean of IT-enabled presence awareness, the relationship between IT-enabled disclosure awareness and directive leadership is now negative for low IT-enabled presence awareness ($\beta = -0.27$; $p < .05$) Thus, Hypothesis 3a is supported.

Fig. 3b and the slope analysis demonstrate that the relationship between IT-enabled disclosure awareness and interpersonal helping is positive for individual members with high IT-enabled presence awareness ($\beta = 0.69$; $p < .01$) and negative for members with low IT-enabled presence awareness ($\beta = -0.45$; $p < .01$). The relationship between IT-enabled disclosure awareness and interpersonal helping is significant for all values of IT-enabled presence awareness that fall outside the region (-0.47, 0.00) standard deviations below and above the mean of IT-enabled presence awareness, respectively. Taken together, these results indicate that (a) for values less than a -0.47 standard deviation below the mean of IT-enabled presence awareness, IT-enabled disclosure awareness is negatively associated with interpersonal helping; (b) for values greater than a 0.00 standard deviation above the mean of IT-enabled presence awareness, IT-enabled disclosure awareness is positively associated with interpersonal helping. Thus, Hypothesis 3b is supported.

Table 5 exhibits a summary of the results.

6. Discussion

This study seeks to examine what motivates virtual team members to self-direct leadership behaviors. We address this question by examining the potential impact of distinct awareness forms—specifically, disclosure awareness, presence awareness and task knowledge awareness—as enabled by ITs. Overall, this research offers support for the particular importance of IT-enabled disclosure awareness in eliciting such behaviors. The results also suggest that different awareness forms supported by ITs signal important cues to virtual team members in shaping their choice of leadership style and interpersonal helping.

In terms of supportive leadership, there was surprisingly no interaction effect between IT-enabled task knowledge awareness and IT-enabled disclosure awareness. Rather, there were main positive effects of IT-enabled task knowledge awareness and IT-enabled disclosure awareness on supportive leadership. As scholars have asserted, supportive leadership is necessary to facilitate conflict resolution and to develop a psychologically supportive working environment (House, 1996; Wendt et al., 2009). Thus, IT-enabled task knowledge awareness prompts team members to enact supportive leadership. In addition, when working with remote or unacquainted members (as was the case for the majority of the team members in our sample), uncertainty regarding the team exists (Antheunis et al., 2012; Cramton, 2001). Researchers have found and contended that self-disclosure is pivotal in facilitating relational development, familiarity and interpersonal attraction, among other positive outcomes (Antheunis et al., 2012; Chiu & Staples, 2013). In keeping with the literature, our results show that IT-enabled disclosure awareness prompts supportive leadership, suggesting that IT-enabled disclosure awareness serves as an uncertainty reductive strategy (Antheunis et al., 2012) such that when members perceive that they know their team at a more personal level, they are more motivated to exercise supportive leadership. Unlike the results for supportive leadership, the results for directive leadership and interpersonal helping are far more complex, but are consistent with our predictions.

While our research indicates that IT-enabled disclosure awareness motivates team members to engage in directive leadership and interpersonal helping, it also shows that when IT-enabled disclosure awareness exists, there are two contingent awareness elements—IT-enabled task knowledge awareness and IT-enabled presence awareness—that team members employ to regulate their

own behavior. When IT-enabled disclosure awareness existed, team members regulated their use of directive leadership and interpersonal helping based on their perceived IT-enabled task knowledge awareness, such that low IT-enabled task knowledge awareness induced team members to engage in such acts in an attempt to move the project forward collectively, while high IT-enabled task knowledge awareness reduced such acts. In a virtual team context, the limited cues increase the tendency for misunderstandings and coordination difficulties (Cramton, 2001; Hoch & Kozlowski, 2014). When an individual perceives low IT-enabled task knowledge awareness, he or she perceives ambiguities in the task environment. Consequently, coordination and communication difficulties arise (Malhotra & Majchrzak, 2014), necessitating directive leadership, which involves explicating work procedures to resolve task ambiguities (Ensley et al., 2006; Lorinkova et al., 2013), and interpersonal helping. IT-enabled disclosure awareness prompts team members to engage in directive leadership and interpersonal helping, but only under the condition of low IT-enabled task knowledge awareness. Indeed, a pronounced challenge faced in virtual teams is social loafing (Alnuaimi et al., 2010). IT-enabled disclosure awareness induces liking and forming interpersonal relationships, fostering individual members to exercise integrative actions with the team (Dirks, 1999; Millikin et al., 2010) and, hence, directive leadership and interpersonal helping based on their perceived IT-enabled task knowledge awareness.

In terms of the moderating effects of IT-enabled presence awareness on directive leadership and interpersonal helping, the pattern of results parallels closely with those of IT-enabled task knowledge awareness. IT-enabled presence awareness serves as a monitoring and evaluation mechanism that team members can leverage on in their use of directive leadership. Further, IT-enabled presence awareness enables team members to render assistance to others who need it. Our finding that there were no main effects of IT-enabled presence awareness on directive leadership and interpersonal helping, reinforces our assertion regarding the importance of IT-enabled disclosure awareness in motivating such acts. Thus, as expected, high IT-enabled presence awareness coupled with high IT-enabled disclosure awareness encouraged directive leadership and interpersonal helping. In contrast, with low IT-enabled presence awareness, there was a negative relationship between IT-enabled disclosure awareness with directive leadership and interpersonal helping. Indeed, the lack of IT-enabled presence awareness may disrupt work process and engender feeling of mistrust, negating the positive association between IT-enabled disclosure awareness with directive leadership and interpersonal helping.

We found the results pertaining to directive and supportive leadership styles intriguing initially, given that they were positively correlated and, yet, their antecedents are largely different. However, we realized that it is possible that supportive leadership is complementary to directive leadership. Individuals who exercise directive leadership also engage in supportive leadership behavior in an attempt to laterally influence others to undertake one's "order" and instructions in view that there are no formal hierarchical differences among members of virtual teams. On the other hand, individuals who exercise supportive leadership do not necessarily engage in directive leadership. Rather, it is dependent on their perceived IT-enabled task knowledge awareness.

In summary, our findings for the roles played by distinct awareness forms enabled by ITs suggest how virtual team members can be motivated to self-direct leadership behaviors. Our results also advance the understanding regarding why team members may not enact a certain leadership style or interpersonal helping.

Beyond contributing to the leadership literature in virtual teams, this study also introduces the disclosure awareness concept. The traditional emphasis of disclosure empirical studies is self-disclosure, i.e. individuals (i.e. disclosers) are asked to rate the extent to which they share personal information about themselves to others. Researchers then investigate the impact of self-disclosure on various important variables such as positive perceptions and conflict. One important argument behind the role of self-disclosure is that recipients will perceive the disclosure as a signal to convey one's warmness and liking. However, this argument is based on the assumption that the recipients pay attention to the personal information communicated by the discloser and thus gain a personal understanding of the discloser. This assumption may not hold. Moreover, compared to a collocated team, it is more difficult for disclosers in dispersed settings to evaluate if recipients are attentive to them as the recipients are less visible (Chidambaram & Tung, 2005). Disclosure awareness, which determines the extent to which an individual knows the personal information of his or her team, will render a significantly more accurate understanding of the impact of disclosure information, especially in virtual teams. We encourage future research that investigates phenomena related to self-disclosure to utilize the concept of disclosure awareness.

6.1. Practical implications

The present research presents several important implications for organizations interested in employing virtual teams for attaining competitive advantage. Organizations will benefit greatly from encouraging team members to reveal personal information regarding oneself (e.g., feelings, photos), contribute to IT-enabled task knowledge awareness (e.g., annotations) and increase one's online availability, as well as putting in place measurements that assess the extent of awareness of these elements. Interventions that regularly remind team members about the need to share such understandings, and assess their extent of specific awareness during the course of a project will be useful. Given the proliferation and prevalence of social media tools, managers should assess if the provided social media tools support team members to develop and maintain specific awareness, which has important consequences on eliciting leadership behavior.

6.2. Limitations and directions for future research

This study is characterized by a few limitations that deserve future attention. First, the data were based on self-reports that were consistent with the focus of this study. Moreover, our analyses indicated no presence of common method bias (Evans, 1985). Subsequent research may compare if discrepancies between perceptual measures and objective measures of leadership behaviors arise. If discrepancies arise, it will be interesting to probe why such differences arise and if such differences impact team effectiveness.

Second, this study was performed with students charged with a relatively short team project and randomly assigned to teams comprising six to seven members who were spatially and geographically dispersed. Although the assignment of a one-time project to temporary ad-hoc newly formed virtual teams is common, the relationships may transfer differently in teams with a history or with a future, or teams assigned to repeated tasks. Also, it may be interesting to perform research to assess the external validity of the examined relationships with organizational virtual teams, given that organizational operations may differ. There are other aspects of dispersion beyond the ones examined in the present research, namely configuration and temporal (Leary, Hall, Hill, & Cummings, 2007). These aspects warrant future investigation.

Finally, given the cross-sectional nature of the data collection, we are not able to determine the dynamics of interactions that may have occurred among the examined variables. For example, it is plausible that team members adjust specific leadership behaviors as their awareness about other members and the task environment changes over time. Such dynamic issues cannot be captured through a snapshot approach, and a longitudinal method is required.

7. Conclusion

The proliferation of ITs offers virtual team members holding diverse expertise and skills unique ways of collaboration. Leadership behaviors are key attributes that enable cognitive resources embedded within a team to be effectively leveraged. Scholars have chronicled the importance of relying on a formal leader to energize "people to action, followers into leaders" (Van & Field, 1990). Our study provides an alternative perspective: developing different awareness supported by ITs, especially IT-enabled disclosure awareness, to enable virtual team members to self-direct their leadership behaviors. Our paper also broadens the self-leadership literature by advancing an awareness perspective in elucidating what influences virtual team members to step back and to step up to the plate in collaboration efforts, providing a more comprehensive view of leadership.

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