A Moderated Mediation Examination of Shared Leadership and Team Creativity:

A Social Information Processing Perspective

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ABSTRACT

Research has mostly focused on how formal leadership can shape a climate for innovation, but we know little about how informal leadership, such as shared leadership, may affect this process. Departing from this dominant focus, we examine how shared leadership may have a positive influence on team processes and performance. Based on social information processing theory, we develop a moderated mediation model that examines the indirect effect of shared leadership on team creativity via a climate for innovation and further investigates the moderating effect of task uncertainty. Two survey-based field studies using multisource, multiwave data support the hypothesized model. The findings reveal that (1) shared leadership positively predicts a climate for innovation, (2) this relationship is stronger when the team faces task uncertainty, (3) a climate for innovation positively predicts team creativity, (4) shared leadership predicts team creativity through the mediating effect of a climate for innovation, and

(5) this mediation effect is stronger when task uncertainty is high. Theoretical and practical implications are discussed.

Keywords: Shared leadership, climate for innovation, team creativity, task uncertainty.

Notes:

- The published article information is as follows:
  - Ali, A., Wang, H., & Boekhorst, J. A. (2023). A moderated mediation examination of shared leadership and team creativity: A social information processing perspective. Asia Pacific Journal of Management, 40(1), 295-327.
  - The URL of the published article is: https://link.springer.com/article/10.1007/s10490-021-09786-6

INTRODUCTION

Organizations often use teams to encourage employees to combine their knowledge and expertise to capture a greater market share, improve customer service, secure additional resources, and encourage more creativity (Hajro, Gibson, & Pudelko, 2017; Shin & Zhou, 2003). In fact, many teams (e.g., product design and development teams) are specifically designed to share and combine their knowledge to foster team creativity, which refers to the generation of novel and useful ideas by team members (Amabile, 1996). However, scholars often assert that the success or failure of a team to produce creative output greatly depends on the context in which these teams operate (Amabile, Conti, Coon, Lazenby, & Herron, 1996; Somech & Drach-Zahavy, 2011). For example, teams are often composed to create synergy and encourage cognitive integration; however, if an innovative team climate is missing, team members may feel less supported in sharing and combining their cognitive resources to achieve team creativity. This absence of an innovative team climate may lead to the loss of valuable cognitive resources within the team and subsequently financial resources within the organization. As such, a supportive team climate is a particularly important context that is critical for team creativity (Černe, Nerstad, Dysvik, & Škerlavaj, 2014) because it leads to increased creative behavior and performance (Chen & Hou, 2016; Somech & Drach-Zahavy, 2011).

Despite the increasing research on team climate for innovation (Newman, Round, Wang, & Mount, 2020), we contend that little is known about the antecedents of a climate for innovation and how it relates to the creativity of work teams. A climate for innovation refers to "the shared perceptions at the team (or organizational) level as to the extent to which team (or organizational) processes encourage and enable innovation" (Newman et al., 2020, p. 77), which can affect team efforts and behaviors to generate creativity (Černe et al., 2014). More

specifically, Anderson and West (1998) describe four essential factors that characterize a climate for innovation. First, a team must have a clearly defined and shared higher order *vision* that motivates team members to work toward clear and attainable goals to facilitate innovation. Second, team members must feel a sense of *participative safety* to express and implement new ways of doing things in a nonthreatening environment. Third, team members must share a collective *task orientation* that emphasizes excellence in the quality of their collective task performance, which aligns with their shared vision for improvement and is characterized by a control system for evaluating and modifying performance. Fourth, there must be *support for innovation* through a shared expectation and practical support from team members and management to identify and implement new ideas to improve processes and performance.

Prior literature has demonstrated that centralized forms of leadership (e.g., transformational leadership) are critical to foster perceptions of a team climate for innovation (Eisenbeiss, van Knippenberg, & Boerner, 2008; Gil, Gil, Rico, Alcover, & Barrasa, 2005; Pirola-Merlo, Härtel, Mann, & Hirst, 2002). However, these studies have remained relatively silent about how other leadership structures may contribute to shaping a team climate for innovation. In the last two decades, there has been an increase in informal leadership research that focuses on shared leadership, which is "a dynamic, interactive influence process among individuals in groups for which the objective is to lead one another to the achievement of group or organizational goals or both" (Pearce & Conger, 2003, p. 1). In other words, shared leadership is a team-level phenomenon whereby leadership is structurally distributed among team members as opposed to one individual who holds a single formal leadership position (Choi, Kim, & Kang, 2017). The intention is to create an environment that provides team members with a sense of autonomy to make meaningful contributions toward team decisions, processes, and performance

(Pearce, Conger, & Locke, 2008). As such, this informal leadership structure involves reciprocal leading and following interactions between team members (Chiu, Owens, & Tesluk, 2016).

We focus on the antecedent role of shared leadership for three reasons. First, as noted above, most studies on team climate for innovation focus on formal types of "top-down" centralized leadership (Eisenbeiss et al., 2008; Khalili, 2016). However, the reality is that leadership within teams is far more complex (Pearce et al., 2008) because there are often reciprocal leader-follower dynamics between team members (i.e., shared leadership) (Pearce & Conger, 2003). Thus, we assert that a focus on shared leadership may provide important insights to fully understand how a team climate for innovation emerges. Second, shared leadership may provide value to the team beyond the benefits that are commonly derived from centralized leadership (Day & Harrison, 2007), which underscores the potential role of shared leadership in fostering a climate that produces greater team creativity. Third, one of the basic tasks of informal leaders within a shared leadership team structure is to shape a team climate (Martin, Cormican, Sampaio, & Wu, 2018) in which team members' creative behaviors are supported and valued (Ren & Zhang, 2015). However, this idea that shared leadership may affect a climate for innovation and, subsequently, team creativity has yet to be theoretically and empirically elaborated. Since teams are regarded as building blocks for organizational creativity and innovation, an investigation of how shared leadership creates a climate that emphasizes creative thinking and innovation to generate more novel and useful ideas at the team level has significant implications for theory and practice.

We use social information processing (SIP) theory (Salancik & Pfeffer, 1978) as an overarching framework to examine the influence of shared leadership on team creativity via a team climate for innovation. In accordance with SIP theory (Salancik & Pfeffer, 1978), we argue

that team members who work in a shared leadership structure retrieve social information from the team environment through leader-follower interactions. Through these interactions, team members exchange information, develop shared patterns of understanding, and create behavioral norms (Anderson & West, 1998; Campion, Medsker, & Higgs, 1993). Since a fundamental aspect of shared leadership involves the importance of identifying the expertise of others through collaborative interactions to build upon the ideas of others (Hoch, 2013), team members who operate in such contexts retrieve social information that indicates that innovation is encouraged, supported, and rewarded, thereby fostering a climate for innovation.

However, a review of the literature suggests that the social information retrieved from the work environment can be influenced by task-related contextual factors in situations of shared leadership (Nicolaides et al., 2014; Serban & Roberts, 2016; Wang, Waldman, & Zhang, 2014). For instance, research finds that shared leadership has a greater effect on team outcomes when there is high task interdependence (Nicolaides et al., 2014) and high task complexity (Bligh, Neck, Pearce, & Kohles, 2006). SIP theory (Salancik & Pfeffer, 1978) suggests that when team members are confronted with uncertain, complex, and ambiguous situations, they seek social information to decrease this lack of clarity. Accordingly, we investigate whether the relationship between shared leadership and a climate for innovation is contingent upon the level of task uncertainty, which refers to a contextual factor that describes situations of unpredictability in terms of the degree to which it is possible for team members to predict which tasks must be executed, when, how, and to what effect (Cordery, Morrison, Wright, & Wall, 2010; Griffin, Neal, & Parker, 2007). We investigate the role of task uncertainty because it is theoretically relevant to the social phenomenon of shared leadership. That is, when there is high task uncertainty, social interactions (i.e., leading and following interactions) are critical to provide

team members with social information to help them better understand how to navigate this uncertainty (Griffin et al., 2007). Furthermore, when task uncertainty is high, team members must navigate their roles according to situational demands (Gardner, Gino, & Staats, 2012; Yang, Huang, & Wu, 2019). In such cases, theory and empirical research collectively suggest that there is more value to be derived from shared leadership when there is high task uncertainty. However, to the best of our knowledge, this contextual variable has not yet been investigated in a shared leadership context. This issue merits scholarly attention to provide novel insights into the conditions under which shared leadership facilitates positive team outcomes. We therefore argue that shared leadership fosters a climate for innovation, particularly when the team context is characterized by high levels of task uncertainty, thereby leading to greater team creativity. These arguments culminate into a conceptual model (Figure 1) that is tested using two field-based survey studies.

This study makes several contributions. First, while research has demonstrated that formal types of leadership occupy an important role in shaping a team climate for innovation (Eisenbeiss et al., 2008; Gil et al., 2005; Pirola-Merlo et al., 2002), research has yet to examine the effect of shared leadership on a team climate for innovation (Newman et al., 2020). Our study contributes to this area of research by revealing that shared leadership has an important role in fostering a climate for innovation. In doing so, we expand our understanding of how different forms of leadership can foster an innovative climate. Second, we illuminate one mechanism that can transfer the effect of shared leadership on team creativity by investigating the mediating effect of a climate for innovation. Hence, this study provides valuable insights into the black box of how shared leadership can affect team creativity by focusing on the critical role of a team climate that emphasizes innovation. Third, recognizing the dynamic context in which

many teams seek to achieve team performance goals, we investigate the moderating effect of task uncertainty as an important contextual factor that has received scant attention in the shared leadership and climate for innovation literature (D'Innocenzo, Mathieu, & Kukenberger, 2016; Newman et al., 2020; Zhu, Liao, Yam, & Johnson, 2018). Our study advances extant research by revealing that the effect of shared leadership on team climate for innovation is contingent upon the level of task uncertainty within the team environment. We advance shared leadership research by demonstrating that some of the positive effects of shared leadership may be optimized in uncertain task environments. Fourth, we empirically advance research on SIP theory by examining the effect of team members as a critical source of social information (Zalesny & Ford, 1990). This issue has been largely ignored by the extant literature, in which the predominant focus has been on formal leadership as a focal source of social information (Chiu et al., 2016; Yang et al., 2019). This study suggests that team members' actions in a shared leadership structure serve as a key source of social information that shapes the team climate and enhances team performance.

THEORY AND HYPOTHESES

Theoretical background: Social information processing theory

According to SIP theory (Salancik & Pfeffer, 1978), team members do not operate in a vacuum within their organization but rather operate in a complex social system. Team members often become motivated to make sense of this environment through a social construction process whereby individuals seek to interpret the social cues within their workplace. Although employees often draw upon this social information to make sense of an array of work experiences (Gundlach, Douglas, & Martinko, 2003), the climate literature suggests that employees largely rely on social information to understand their team climate (Chiang, Chen,

Liu, Akutsu, & Wang, 2021; Priesemuth, Schminke, Ambrose, & Folger, 2014). Although leaders often serve as a critical source of social information that fosters perceptions of the team climate (Chiu et al., 2016), some research suggests that team members also provide an important source of social information that may shape members' beliefs about the team climate (Wang, De Pater, Yi, Zhang, & Yang, 2020; Zalesny & Ford, 1990).

Since team members often react similarly to shared social environmental cues (Mayer, Aquino, Greenbaum, & Kuenzi, 2012), these shared interpretations create a foundation for a shared team climate. In other words, team members serve as an important source of social information that is instrumental in helping team members collectively make sense of their shared work environment. Although research has shown how different team dynamics affect team climate (Farnese & Livi, 2016), we argue that shared leadership may affect the type of climate that develops within a team. Shared leadership involves complex social interactions, including close interactive relationships through which team members delegate or claim leadership roles (DeRue, 2011). Before we elaborate upon shared leadership, we differentiate shared leadership from centralized leadership (e.g., transformational leadership) according to three key dimensions: 1) locus (i.e., centralized leadership emphasizes the role of one individual, whereas shared leadership emphasizes the role of multiple team members), 2) formality (i.e., centralized leadership provides formal authority to one individual, whereas shared leadership provides authority to multiple team members), and 3) magnitude of influence (i.e., centralized leadership comprises a top-down/vertical structure to influence others, whereas shared leadership comprises a high-density horizontal structure) (Carson, Tesluk, & Marrone, 2007; DeRue, 2011; Morgeson, DeRue, & Karam, 2009). Accordingly, shared leadership is considered an internal/informal/horizontal style of leadership (as opposed to the external/formal/vertical style

of centralized leadership). In other words, shared leadership occurs when multiple team members perform leadership roles through horizontal social interactions to influence team members to facilitate task completion. This contrasts with centralized leadership, in which leadership roles are constrained to one individual who exerts a top-down influence on team members to achieve team goals. We focus on the role of shared leadership in shaping team members' perceptions of their team climate because shared leadership fosters an autonomous and psychologically safe environment where risk-taking is supported and collective contributions are encouraged (Klasmeier & Rowold, 2020; Pearce et al., 2008; Pearce, Wood, & Wassenaar, 2018).

Specifically, shared leadership is conceptualized as a network-based informal leadership structure that develops through leading and following interactions, which provide team members with autonomy and control over team decisions to improve performance (Carson et al., 2007). In other words, multiple (or all) team members share leadership roles and responsibilities, engage in collaborative decision-making, and accept shared responsibility for the team goals (Hoch, 2013). Shared leadership is further characterized by significant trust, whereby team members openly share legitimate and accurate information (Chiu et al., 2016). SIP theory (Salancik & Pfeffer, 1978) suggests that shared leadership involves interactive social dynamics that play a critical role in imbuing social cues into the work environment with respect to the types of behaviors that are encouraged, supported, and rewarded. One of the fundamental aspects of shared leadership is knowledge sharing between team members to help individuals build and expand upon the ideas of others (Hoch, 2013). As such, shared leadership may improve team creativity (He et al., 2020), but this may be partly explained by the way employees perceive the team climate in terms of the types of expected behaviors. Since shared leadership is change-oriented and fosters creative thinking, risk-taking, and collaboration (Chiu et al., 2016; Klasmeier & Rowold, 2020;

Zhou, Zhang, & Shen, 2017), we contend that shared leadership serves as an important source of social information that shapes a climate for innovation to foster team creativity.

Although social information that derives from shared leadership can play a pivotal role in shaping the team climate and the behaviors of team members, SIP theory suggests that this social information is even more valued by team members when they are confronted with uncertainty (Salancik & Pfeffer, 1978). Stated differently, in uncertain situations, team members are particularly likely to seek out social information in the team environment to make sense of how to address this uncertainty. Thus, we identify task uncertainty as a contextual feature that moderates the effect of shared leadership on a team climate for innovation. We theorize that team members who work in uncertain contexts are particularly likely to retrieve social information within their team context to gain information on how to address this uncertainty. More specifically, team members retrieve social cues from the shared leadership structure, which conveys that collaborative work behaviors that involve information sharing to generate innovation are expected from team members. As such, we hypothesize that shared leadership affects a climate for innovation and, subsequently, team creativity, which is strengthened under conditions of high task uncertainty within the team.

Hypothesis development: Shared leadership, climate for innovation, and team creativity

Team climate research (Newman et al., 2020) identifies leadership as one of the main sources of a climate for innovation. Most studies emphasize the conventional paradigm of centralized forms of leadership, such as transformational leadership (Eisenbeiss et al., 2008), authentic leadership (Edú-Valsania, Moriano Juan, & Molero, 2016), and change-oriented leadership (Gil et al., 2005). However, these studies fail to offer insights into how informal forms of leadership may shape a climate for innovation, which is an important omission given that the

strength of a team resides in the social interactions of team members (e.g., for a review, see Schneider, Gonzalez-Roma, Ostroff, and West, 2017). As such, we investigate shared leadership that occurs when leadership is distributed among team members, which is characterized by reciprocal leader-follower dynamics where team members direct, motivate, and support each other (Carson et al., 2007). Drawing from SIP theory (Salancik & Pfeffer, 1978), we posit that shared leadership is critical to foster a team climate that encourages innovation because this form of leadership involves collaborative interactions to generate creative ideas (Hoch, 2013) that impart social information about the importance of innovation into the team environment.

Shared leadership naturally involves social interactions that send social cues into the team environment. This facilitates shared perceptions of a climate for innovation, which involves an innovative vision, participative safety, task orientation, and support for innovation (West, 1990). First, Pearce and Ensley (2004) posit that one critical aspect of shared leadership is a team vision, which provides a collective sense of the future state of the team. Since a team vision is best formulated through the collective efforts of team members (Conger & Kanungo, 1998), a collectively developed vision is likely to make team members feel motivated, empowered, and committed to the team (Zhang, Waldman, & Wang, 2012). SIP theory (Salancik & Pfeffer, 1978) suggests that a shared team vision imbues the environment with social cues with respect to the types of behaviors that are encouraged, supported, and rewarded. Since an important element of shared leadership emphasizes knowledge sharing to foster innovative thinking (Hoch, 2013), we suggest that shared leadership involves social interactions that emphasize the importance of innovative thinking, which send social information into the team environment that indicates the importance of innovation within the team. Team members retrieve and make sense of these social cues to form a collective understanding of a shared *innovation vision* within the team.

Second, shared leadership involves collaborative decision-making in that team members are encouraged to share ideas and take risks (Zhou et al., 2017). Since shared leadership involves sharing leader-focused roles and responsibilities (Pearce et al., 2008), there is a concerted effort to elicit and support the diverse viewpoints of team members who occupy different team roles. However, role sharing must involve an interpersonally safe environment to stimulate this diversity of thought from others (Liu, Hu, Li, Wang, & Lin, 2014). In accordance with SIP theory (Salancik & Pfeffer, 1978), team members impart social information into the team environment through their leader-role sharing, which indicates the importance of participative safety within the team. Based on research that demonstrates that shared leadership is linked to team psychological safety (Liu et al., 2014), we argue that shared leadership is important in shaping perceptions of *participative safety* (Anderson & West, 1998), where team members feel safe in proposing new ideas and creative solutions in a nonjudgmental team climate.

Third, another important aspect of shared leadership is a collective commitment to team goals and increased performance (Pearce et al., 2008). Since shared leadership involves the distribution of leader responsibilities among team members (Pearce & Conger, 2003), there is shared control and responsibility to work toward team goals. Team members engage in reciprocal leader-follower interactions and collaborate to achieve team success. In turn, this shared *task orientation* increases their collective contributions toward team tasks to achieve higher team performance. In accordance with SIP theory (Salancik & Pfeffer, 1978), we propose that team members who engage in reciprocal interactions share the responsibility to achieve team outcomes, which sends social cues into the team environment that team members are expected to devote their individual efforts to work toward team excellence. Based on research that demonstrates that shared leadership is linked to commitment (Wu & Chen, 2018), we reason that

shared leadership conveys social information that fosters a shared belief in the importance of team members who have a commitment to "excellence of quality of task performance" (Anderson & West, 1998, p. 240).

Finally, shared leadership emphasizes the importance of team members who encourage and support each other as they work toward team goals (Pearce et al., 2018). SIP theory (Salancik & Pfeffer, 1978) suggests that these dynamic leader-follower interactions send social information into the team environment that signals that supportive behaviors are expected. Since shared leadership involves information sharing to foster new ideas (Hoch, 2013), we reason that shared leadership creates a shared sense of *support for innovation*, whereby innovative behaviors from leaders and followers send social information into the team environment that encourages others to support innovative efforts to achieve team goals.

In sum, we draw upon SIP theory to investigate how shared leadership imbues the team environment with social information about the importance of a shared vision, participative safety, task orientation, and support for innovation to foster a team climate for innovation.

Hypothesis 1. Shared leadership in a team is positively related to the team climate for innovation.

Although team climate research describes the kind of behaviors that are expected from team members (Hajro et al., 2017), facet-specific climates indicate that very specific behaviors are expected (Khalili, 2016; Wimbush & Shepard, 1994). SIP theory and research are often show that the social information within the team environment conveys expectations of specific behaviors, which then leads to these expected behaviors (Priesemuth et al., 2014; Yang et al., 2019). Accordingly, a shared team climate centered on innovation imbues the team environment with social cues that indicate that innovative behaviors are encouraged, supported, and rewarded,

which leads to more team creativity. Drawing insights from SIP theory (Salancik & Pfeffer, 1978), we theorize that a climate for innovation signals that innovative behaviors are valued, which enhances team creativity.

A team climate for innovation conveys that the team collectively values behaviors that emphasize innovation (Anderson & West, 1998). SIP theory (Salancik & Pfeffer, 1978) suggests that this shared belief about the importance of innovation inspires team members to combine their efforts to generate more novel and useful ideas. Since team members often rely on their work environment to generate creative ideas (Amabile et al., 1996), members who retrieve social information from a team environment that emphasizes innovation are likely to perceive behavioral expectations to discuss and expand upon the ideas of others. In turn, team members are well positioned to identify new ways to solve problems and show commitment to collective efforts to achieve creative goals within their team. Based on research that demonstrates that a climate for innovation is linked to greater team creativity (Khalili, 2016), we theorize that a shared climate for innovation within the team environment fosters greater team creativity.

Hypothesis 2. The team climate for innovation is positively related to team creativity.

SIP theory suggests that shared leadership serves as an important source of social information that shapes team members' perceptions that innovation is expected, thereby fostering a climate for innovation (H1). In turn, a climate for innovation provides team members with social information within the team context that indicates that creative thinking, initiative-taking, and safe interpersonal risk-taking are encouraged, supported, and rewarded behaviors. This shared interpretation motivates team members to share their ideas and perspectives, which fosters team creativity (H2). Therefore, we propose that shared leadership indirectly influences team creativity through a climate for innovation.

Hypothesis 3. A team climate for innovation mediates the relationship between shared leadership and team creativity.

The moderating role of task uncertainty

Although leadership scholars readily acknowledge that shared leadership has a positive effect on many team outcomes (Liu et al., 2014; Lyndon, Pandey, & Navare, 2020; Zhou et al., 2017), research suggests that there is large unexplained variance (r = .15-.37) in the effect of shared leadership on team outcomes (D'Innocenzo et al., 2016; D. Wang et al., 2014). As such, there is an important need to examine the boundary conditions that may illuminate this effect. To date, research has identified several moderating factors, such as task complexity (Bligh et al., 2006), task interdependence (Nicolaides et al., 2014), job variety (Liu et al., 2014), team member competence (Chiu et al., 2016), team tenure (Nicolaides et al., 2014), and vertical leadership (He et al., 2020). We build upon this research by examining the moderating effect of task uncertainty – that is, a team context in which team members face incomplete information about a task-related situation, which creates an unpredictable and ever-changing team environment (Sapienza & Gupta, 1994).

We focus on the moderating effect of task uncertainty on the relationship between shared leadership and climate for innovation for several reasons. From a theoretical standpoint, SIP theory (Salancik & Pfeffer, 1978) suggests that uncertain situations affect how employees socially construct their understanding of their work experiences. Since many teams that adopt a shared leadership structure often work in uncertain environments (Hsu, Li, & Sun, 2017), there is an important theoretical need to understand how an uncertain environment may affect the way a shared leadership structure influences a climate for innovation. From an empirical standpoint, research argues that management structures that involve empowerment through autonomy and

the delegation of decision-making responsibilities often improve performance to a degree that team members encounter "variability and lack of predictability in work tasks and requirements, including what has to be done and how to do it" (Wall, Cordery, & Clegg, 2002, p. 151). Therefore, this vein of research underscores the theoretical and empirical importance of investigating the moderating role of task uncertainty.

On the one hand, we theorize that the effect of shared leadership on a climate for innovation is stronger when task uncertainty in the team is high. Drawing from SIP theory (Salancik & Pfeffer, 1978), we theorize that team members who work in a shared leadership environment where there is high task uncertainty seek social information that manifests from leader-follower dynamics to understand how to manage this uncertainty. Since many teams work in dynamic environments that involve ever-changing work conditions (Gardner et al., 2012), there is often uncertainty about team tasks, such as a lack of clarity about the knowledge needed to effectively perform work tasks, steps to successfully complete team tasks, and the processes to satisfy customer demands and meet their expectations (Gardner et al., 2012; Yang et al., 2019). Since contexts that involve uncertain tasks are ambiguous and make it difficult to move forward (Cash & Kreye, 2018; Cordery et al., 2010; Shuanglong Wang, Eva, Newman, & Zhou, 2020), employees who work in a shared leadership structure seek social information from their team members to better understand how to cope with this uncertainty. Indeed, shared leadership provides a critical source of social information to accomplish complex tasks in dynamic situations (Pearce, Conger, & Locke, 2007; Pearce et al., 2018). Since shared leadership involves information sharing to generate novel and useful ideas (Hoch, 2013), we posit that team members are particularly likely to retrieve social cues that encourage them to collaboratively solve problems to work through uncertain situations to accomplish team goals. This social

information conveys that team members are expected, supported, and encouraged to be innovative to address uncertainty. Therefore, we theorize that the positive relationship between shared leadership and team climate for innovation is strengthened when there is high task uncertainty.

On the other hand, we argue that the effect of shared leadership on a climate for innovation is weaker when task uncertainty is low. SIP theory (Salancik & Pfeffer, 1978) suggests that team members who work in a team with shared leadership but who also operate in a context of low task uncertainty retrieve and interpret social information in the team environment, which highlights the importance of innovative behaviors. Research suggests that teams often become more rigid and committed to established policies and procedures when they work in contexts where task uncertainty is low (i.e., highly certain contexts) (Keck, 1997). In such circumstances, team members feel less inclined to adopt novel strategies to solve problems (Katz, 1982). Building on this, team members are less likely to seek out and retrieve social information that manifests from shared leadership because their work context is clear in terms of the expected behaviors to accomplish team tasks. Drawing upon SIP theory (Salancik & Pfeffer, 1978), team members who encounter situations of low task uncertainty (i.e., highly routine tasks that are well defined and highly structured in predictable situations) are much less motivated to seek out social information to understand how to perform their task assignments. Since shared leadership structures provide members with autonomy and control over team processes, team members may also feel more independent and self-sufficient in the context of clear task demands (Yang et al., 2019). Thus, there is little motivation to seek and process additional unnecessary social information from the team environment. As such, the positive effect of shared leadership on a climate for innovation is weaker when there is low task uncertainty.

H4: Task uncertainty moderates the positive effect of shared leadership on a team climate for innovation, such that when the level of task uncertainty is high, the positive effect of shared leadership on a climate for innovation is enhanced, and when the level of task uncertainty is low, this relationship is weakened.

An integrated model

Thus far, we have argued that shared leadership indirectly influences team creativity via a climate for innovation (H3). Drawing from SIP theory, we further proposed that the positive effect of shared leadership on a climate for innovation is strengthened when the team operates in uncertain task conditions (H4). Building on these arguments, we develop an integrated model that deepens our understanding of how shared leadership influences a team climate for innovation and subsequently enhances team creativity by theorizing that this relationship is strengthened under high levels of task uncertainty.

H5: Task uncertainty moderates the indirect effect of shared leadership on team creativity via a team climate for innovation, such that the positive indirect effect becomes stronger when the level of task uncertainty is high than when task uncertainty is low.

OVERVIEW OF STUDIES

To test the hypotheses in our conceptual model, we adopted a two-study research design. In study 1, we tested the hypotheses with survey data collected from the construction industry. In particular, study 1 investigates the indirect effect between shared leadership and team creativity via a climate for innovation, which is moderated by task uncertainty. Study 2 replicates the results of study 1 in addition to increasing the generalizability of the findings.

STUDY 1: METHODS

Field setting and research design

The sample for study 1 included 233 team members and 48 team leaders from the construction industry in Pakistan. We collected data from four organizations registered with the Pakistan Engineering Council. Since the construction industry in Pakistan is growing at a rapid pace, organizations face unexpected issues, requiring a workforce that can solve problems creatively. Thus, organizations in the construction industry use team-based structures to increase knowledge sharing to solve these challenges (Zhang & Ng, 2013). We decided to focus on the construction industry because many work teams face considerable uncertainty in this industry (Vaziri, Carr, & Nozick, 2007). For example, the architectural team is often uncertain about the impact of external changes on their work because slight changes in building elements or materials can significantly influence the building temperature. Similarly, the electrical engineering team often faces uncertainty about the future of energy consumption and the consequent use of material quality. The design team also encounters frequent uncertainty in terms of accommodating electrical and plumbing provisions while strictly adhering to the architectural details such that any minor lapse in these details can lead to significant changes in design. Finally, project management and support teams often encounter uncertainty in accommodating multitrade tasks in confined spaces because a slight overlap in task assignment can significantly affect the targeted schedule.

After approval, we arranged informal interviews with human resources (HR) managers to understand the teamwork patterns of the target organizations. We found that low-level managers are considered a valuable asset because they work together with their team to accomplish their tasks. Top managers delegate authority to these managers to devise work operations, procedures,

and systems. Based on these interviews and with additional help from the HR departments, we identified 54 teams of low-level managers, mainly from the project design and support unit, project planning unit, electrical engineering design unit, and architecture unit, who had a shared senior-level manager.

In this suitable context for studying shared leadership and team climate in an uncertain context, we decided to collect data at three points in time. At time one, team members recorded their responses to survey items about shared leadership, task uncertainty, and control variables (e.g., transformational leadership, team autonomy), which included demographic information. At time two, a month after the first round of the data collection, respondents of the first round were contacted again. This time, team members reported on climate for innovation items. Finally, at time three, a month after the second survey, we invited team leaders to rate the creativity of their teams. Initially, the sample size consisted of 269 members of 54 teams. In the first round, we received responses from 251 members (93% response rate) who were embedded in 51 teams (94% response rate). In the second round, 241 responses (90% response rate) were received from the same respondents from the first round. In the third round, 49 team leaders submitted their responses about team creativity (91% response rate). Therefore, the final sample consisted of 48 teams comprising 233 members (male = 69%, mean age = 36 years). The team response rate was 89%, and the individual response rate was 87%. Each team comprised 4 to 7 members, with an average of 4.85 members in each team. Because of the involvement of HR, we managed to secure a 90% response rate from each team, which was necessary to calculate network analysis (Wasserman & Faust, 1994).

Measures

Our survey instrument was developed based on previously validated measures (see Appendix A for measures used in study 1 and 2). The team members and leaders recorded their responses using 7-point Likert scales for all measures unless otherwise indicated.

Shared leadership: A social network approach was used to measure the level of leadership sharing within each team (Carson et al., 2007), which has been validated by previous studies (Chiu et al., 2016; Ishikawa, 2012). We measured the density of shared leadership networks in teams (Mathieu, Kukenberger, D'Innocenzo, & Reilly, 2015). This approach indicates that a higher density reflects a greater level of shared leadership within the team. Each team member was asked to rate each of his or her teammates on a 5-point Likert scale, which ranged from 1 = "not at all" to 5 = "to a very great extent". We used a single item (i.e., To what degree does your team rely on this individual for leadership?) adopted from Carson et al. (2007). We followed the approach advocated by Sparrowe, Liden, Wayne, and Kraimer (2001), which was further validated by Chiu et al. (2016). This approach is a widely adopted method of network leadership that scholars use to calculate leadership density (Chiu et al., 2016; Klasmeier & Rowold, 2020). In doing so, we summed all of the values and then divided that sum by the total possible number of ties among team members.

Climate for innovation: We used five items adapted from Weiss, Hoegl, and Gibbert (2011) to measure team climate for innovation ($\alpha = .96$). These items were initially based on the studies conducted by Anderson and West (1998) and Joshi and Sharma (2004). A sample item is "In my team, creation and sharing of new knowledge are supported". The climate for innovation was rated by individual members of each team. Although the scale was targeted at the team level, we checked the appropriateness of the aggregation of the individual responses to the team level

by calculating the interrater agreement values (R_{wg}), interclass correlation coefficients (ICC[1] and ICC[2]), and F statistics (Bliese, 2000; James, Demaree, & Wolf, 1984). Previously, Bliese (2000) suggested that a value of R_{wg} that is greater than .70 is sufficient for justifying aggregation and that the recommended cutoff value for ICC(1) is .05 (Bliese, 2000), whereas .61 is considered reasonable for ICC(2) (Glick, 1985). However, team size significantly impacts the calculation of ICC(2); therefore, on average, small team sizes are likely to generate low values of ICC(2) (Gong, Law, Chang, & Xin, 2009). Moreover, researchers (Bliese, 1998; Bliese, 2000; Gong et al., 2009) have cautioned that teams with fewer than 10 members limit the applicability of analyzing the ICC(2) to justify data aggregation. However, studies suggest that ICC(2) values that are over .25 are acceptable when the ICC(1) and F statistics are significant (Chiu et al., 2016; Dietz, van Knippenberg, Hirst, & Restubog, 2015). The results indicated that the values of R_{wg} = .87, ICC(1) = .13, ICC(2) = .42, and F = 1.71 (p<.01) were within acceptable ranges. Thus, based on the above results, we aggregated the individual-level responses to generate an overall team-level climate for innovation construct.

Team creativity: Team leaders were asked to rate the creativity of their team using a 6-item measure adopted from Shin, Kim, and Lee (2016) (α = .95). Leader ratings to measure team performance and creativity are widely used in the literature (Shin & Eom, 2014; Zhang et al., 2012). A sample item is "My team members come up with creative solutions to problems".

Task uncertainty: Task uncertainty faced by the team members was measured through responses provided to a three-item scale by Gardner et al. (2012) (α = .85). The items were reverse coded. A sample item is "It is clear to my team members what the outcome of this project will look like". The values of R_{wg} = .85, ICC(1) = .28, ICC(2) = .65, and F = 2.85 (p<.001) were all above the threshold, which justified team-level aggregation.

Control variables: We included team-level demographics as control variables because they may affect the relationships of interest. We controlled for mean team size, team tenure, and leader tenure given their importance in previous research (Chiu et al., 2016; Shin & Zhou, 2007). Furthermore, a recent study (Chiu et al., 2016) noted that team autonomy is linked to shared leadership. Therefore, we adapted a 3-item autonomy scale (Morgeson & Humphrey, 2006) to measure team autonomy (α = .86). We used it as a control variable to reduce any effects related to team autonomy on climate for innovation and team creativity. A sample item is "The job allows us to make a lot of decisions by our team members". We calculated the values of R_{wg} = .88, ICC(1) = .15, ICC(2) = .45, and F = 1.83 (p<.01), which justified the aggregation of team autonomy responses. Finally, formal and informal leadership may coexist in teams (Chiu et al., 2016). Although our focus is on shared leadership, formal leadership may provide important social cues with respect to the kinds of behaviors that are deemed acceptable and rewarded by leaders (Zalesny & Ford, 1990). For example, transformational leadership has been found to shape team climate, which positively affects team creativity (Eisenbeiss et al., 2008; Shin & Zhou, 2003). Therefore, we used a 5-item scale taken from earlier research (Carless, Wearing, & Mann, 2000) to measure transformational leadership (α = .91), which has been validated in other studies (Arnold, Turner, Barling, Kelloway, & McKee, 2007; Ghadi, Fernando, & Caputi, 2013; Mullen & Kelloway, 2009). Sample items are "Our leader gives encouragement and recognition to team members" and "Our leader encourages thinking about problems in new ways and questions assumptions". The mean value of R_{wg} = .93, ICC(1) = .30, ICC(2) = .68, and F = 3.08 (p<.001) support the aggregation of individual team member responses to generate a team-level transformational leadership measure.

RESULTS AND DISCUSSION

Descriptive statistics

The means, standard deviations, correlations, and reliabilities of the variables of study 1 are presented in Table 1. Correlations among the study variables provide initial support for our hypothesized relationships.

Confirmatory factor analyses

Following the recommendations of Anderson and Gerbing (1988), a set of confirmatory factor analyses (CFAs) were performed to examine the discriminant validity of the study variables. We included multiple item variables to conduct the CFA on both individual- and team-level data to confirm the validity of the data. The CFA results are considered reasonable to justify the discriminant validity of the variables provided that the fit indices generate a root mean square error of approximation (RMSEA) below .08 (Browne & Cudeck, 1993) and a Tucker-Lewis index (TLI) and comparative fit index (CFI) above .90 (Tucker & Lewis, 1973). The results of the CFA analyses are presented in Table 2. The alternative model test results reveal that at the individual level, the four-factor model was the best fit with the data (chi square ($\chi 2$) = 158.54, degrees of freedom (*df*) = 97, TLI = .97, CFI = .98, RMSEA = .05) compared with alternative models. However, at the team level, the five-factor model fit the data ($\chi 2$ = 241.09, *df* = 181, TLI = .94, CFI = .95, RMSEA = .08) better than the alternative models. Together, the results confirm the discriminant validity of the study variables.

Following individual- and team-level CFA analyses, we considered the multilevel nature of the data in which most of the variables were assessed by team members, where shared leadership was a network measure and team creativity was rated by the team leader. We conducted a multilevel CFA in which climate for innovation, task uncertainty, team autonomy,

and transformational leadership were individual-level variables and shared leadership and team creativity were team-level variables. The analysis generated $\chi 2 = 504.98$, $df = 216$, TLI = .92, CFI = .94, RMSEA = .08, revealing a reasonable fit to the data. Thus, the multilevel CFA further confirmed the discriminant validity of the data.

The results also indicate that the one-factor model at the individual level ($\chi 2 = 1564.11$, $df = 103$, TLI = .42, CFI = .50, RMSEA = .25) and at the team level ($\chi 2 = 830.74$, $df = 191$, TLI = .37, CFI = .48, RMSEA = .27) yielded the worst fit. Thus, the findings confirm that common method variance likely did not affect the data (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003).

Hypotheses testing

We used the PROCESS macro (model 7) (Hayes, 2013) to test the model using study 1 dataset. Following Aiken and West (1991), we mean-centered the data prior to testing the model.

Hypothesis 1 proposed that shared leadership is positively related to a climate for innovation. The regression results (Table 3) reveal that shared leadership is positively related to a climate for innovation ($\beta = .44$, t = 3.46, $p<.001$), which supports hypothesis 1. The results (Table 3) also reveal that a climate for innovation is positively related to team creativity ($\beta = .34$, t = 2.54, $p<.01$), thus supporting hypothesis 2. In line with hypothesis 3, shared leadership has a positive indirect effect on team creativity via a climate for innovation (effect = .18, SE = .08, 95% CI [.06, .35]). A normal theory test also found a significant mediating effect of a climate for innovation between shared leadership and team creativity (effect = .18, $z = 2.48$, $p<.01$).

This study further proposed that task uncertainty enhances the positive effect of shared leadership on the team climate for innovation. Accordingly, the results (Table 3) reveal that there is a significant interaction between shared leadership and task uncertainty on the team climate for innovation ($\beta = .29$, t = 2.05, $p<.05$), which supports hypothesis 4. The simple slopes analysis

(Figure 2) shows that when task uncertainty is high (i.e., one standard deviation above the mean), the slope of shared leadership on the team climate for innovation is significantly positive (β = .73, t = 4.35, p<.001), but when task uncertainty is low (i.e., one standard deviation below the mean), the slope is insignificant (β = .16, t = 1.25, ns). Furthermore, hypothesis 5 posited that the indirect effect of shared leadership on team creativity via a climate for innovation would be moderated by task uncertainty. The results (Table 4) reveal that the indirect effect of shared leadership on team creativity was stronger at high levels of task uncertainty (β = .29, SE = .13, 95% CI [.07, .58]) than at low levels (β = .07, SE = .09, 95% CI [-.13, .22]). Hence, hypothesis 5 is supported. The index of the moderated mediation (β = .10, SE = .06, 95% CI [.01, .25]) also confirms that the positive indirect effect of shared leadership on team creativity via a climate for innovation varies at levels of task uncertainty.

Overall, in study 1, we find that shared leadership is positively related to a team climate for innovation, which subsequently influences team creativity. In addition, this study finds a significant effect of task uncertainty on the direct relationship between shared leadership and a climate for innovation. Furthermore, we find that the indirect effect of shared leadership on team creativity via a climate for innovation is moderated by task uncertainty.

Although study 1 provides important insights, this study has limitations. First, the sample size is relatively small, which underscores the need to replicate the findings with a larger sample. Second, we considered leader ratings of team creativity using previously validated measures. Although this is a widely accepted approach (Fong, Men, Luo, & Jia, 2018; Hu, Erdogan, Jiang, Bauer, & Liu, 2018; Li, Li, Li, & Li, 2020), recent studies question the measurement of team creativity using subjective measures (e.g., Hughes, Lee, Tian, Newman, & Legood, 2018). Third, field study contexts vary greatly, which can alter the effect of shared leadership on team climate.

We collected data from the construction industry, which might limit the generalizability of these findings. Both theoretical and practical implications highlight the need to replicate the hypothesized relationships in other contexts to provide more valuable insights for researchers and practitioners.

We sought to address these limitations in a different context. In study 2, we examined the hypotheses tested in study 1 with a larger and different sample. Furthermore, we used objective measures for assessing team creativity. Importantly, we tested the direct, mediated, and moderated relationships in the information technology industry, which provides further evidence of the effect of shared leadership in different contexts.

STUDY 2: METHODS

Field setting and research design

In study 2, we collected time-lagged survey data from information technology (IT) project teams. These teams develop software for commercial clients. We selected this sample for several reasons. First, IT project teams are knowledge-oriented teams that operate in a dynamic field because technology is always changing and improving, which highlights the need for team members to continuously update their knowledge and skills. Second, customer input at every stage of the development process is critical to satisfy customer needs. As with many product development processes, customer requirements are not static. Customers may identify changes in the product description and design at different points in the development lifecycle. Based on this, task uncertainty is considered a key characteristic of IT project teams (Gopal, Sivaramakrishnan, Krishnan, & Mukhopadhyay, 2003). In our sample, the teams had autonomy, and team members had to interact with each other to achieve shared team goals. Each team in our sample consisted

of at least four members who had an appointed leader who was responsible for the overall team performance. However, team leaders did not engage in the daily team activities and decisions.

A contact person from the selected organizations helped us distribute the questionnaires to each team member across three phases with a three-month gap between each survey. Each questionnaire included an information letter (e.g., purpose of the research, assured confidentiality) to obtain informed consent. At time 1, we asked team members to rate shared leadership, task uncertainty, and the control variables. At time 2, respondents of the first survey were asked to rate the team climate for innovation measure. At time 3, the HR departments were provided with an interval scale to evaluate the creativity rewards provided to each of the teams, in line with Chen and Hou (2016).

During the first wave, the questionnaires were distributed to 430 members of 85 teams. In response, we received questionnaires from 416 members of 81 teams. In the second round, we distributed questionnaires to these same 416 members and received 391 responses. Finally, the HR department provided creativity reward ratings for 78 teams. Overall, the surveys secured a response rate of 89% at the individual level and 92% at the team level. After deleting incomplete responses and data from teams that did not meet the selection criteria (i.e., team tenure less than 6 months and less than a 90% team response rate), the final sample consisted of 78 teams that comprised 382 members (male = 55%, mean age = 33 years). The average team size was 4.9 members (ranging from 4 to 7 members).

Measures

In study 2, because all respondents were Chinese, we translated the instrument into Chinese. A back translation approach as defined by Brislin (1980) was used to confirm the

accuracy of the translation. The same 7-point Likert scale (1 for "strongly disagree" to 7 for "strongly agree") was used in study 2 for all measures unless otherwise stated.

Shared leadership: Similar to study 1, the social network methodology, which uses a network density measure of shared leadership, was adopted from Carson et al. (2007). A 5-point scale (1 for "not at all" to 5 for "to a very great extent") was used to measure shared leadership.

Climate for innovation: We measured climate for innovation using the 14-item scale from Kivimaki and Elovainio (1999), which was based on the work of Anderson and West (1998). This abbreviated measure has been validated in other studies (Chen & Hou, 2016). The 14 items capture a climate for innovation across four dimensions (i.e., vision = 4 items, participative safety = 4 items, task orientation = 3 items, support for innovation = 3 items). We found acceptable values of $\alpha = .75$, $R_{wg} = .91$, ICC(1) = .10, ICC(2) = .35, and F = 1.54 ($p<.01$) for vision; $\alpha = .84$, $R_{wg} = .94$, ICC(1) = .08, ICC(2) = .29, and F = 1.41 ($p<.05$) for participative safety; $\alpha = .72$, $R_{wg} = .83$, ICC(1) = .31, ICC(2) = .69, and F = 3.23 ($p<.001$) for task orientation; and $\alpha = .80$, $R_{wg} = .93$, ICC(1) = .07, ICC(2) = .53, F = 1.38 ($p<.05$) for support for innovation. We conducted a second-order confirmatory factor analysis to assess whether these four second-order factors could be treated as the core dimensions of team climate for innovation. As the analysis yielded a reasonable fit ($x^2 = 103.051$, $df = 73$, CFI = .98, TLI = .98, and RMSEA = .03), we averaged each item to represent the four dimensions of a team climate for innovation.

Task uncertainty: Task uncertainty was measured with responses provided by team members who completed a three-item scale by Gardner et al. (2012) ($\alpha = .78$). The values justified team-level aggregation because the values ($R_{wg} = .91$, ICC(1) = .22, ICC(2) = .58, F = 2.36 ($p<.001$)) were all within an acceptable range.

Team creativity: Although measuring team creativity through leader ratings represents the most common approach (Hu et al., 2018; Li et al., 2020; Shin & Zhou, 2007), this survey-based approach is limited in that it may not provide a true assessment of creativity. For instance, subjective leader ratings of team creativity may be biased (un)intentionally because of several factors, such as the halo effect, demographic characteristics, and impression management concerns. To avoid these concerns, scholars have gradually introduced objective measures of creative performance. These scholars have suggested that creativity bonuses, ideas proposed during suggestion programs, research reports, rewards for creativity, assessments by independent judges, and patent disclosures may serve as better measures of creativity (Chen & Hou, 2016; Liao, Liu, & Loi, 2010; D. Liu, Wang, & Wayne, 2015; Somech & Drach-Zahavy, 2011). In line with these studies and to overcome the measurement limitation of team creativity in study 1, we used an objective measure of creativity that was adopted from Chen and Hou (2016). A nominal scale to assess creativity was used because company policies prevented the HR departments from providing data about the objective monetary rewards paid to the teams. With the support of the HR departments, we evaluated the reward patterns and the range of the reward amounts provided to the teams. Generally, the teams were rewarded on a monthly and quarterly basis according to the assessment of the creative performance of the team. Accordingly, we developed a five-point scale that indicated the extent to which teams received creativity rewards in Chinese yuan (1 = "5,000 and below", 2 = "5,001 – 10,000", 3 = "10,001 – 15,000", 4 = "15,001 – 20,000", 5 = "20,001 and above"). This measure assessed the creative performance of each team six months after the first wave of the survey.

Control variables: We used the same control variables as the first study. The following analyses for team autonomy ($\alpha = .78$, $R_{wg} = .94$, ICC(1) = .64, ICC(2) = .90, and F = 9.66

(p<.001)) and transformational leadership (α = .91, R_{wg} = .96, ICC(1) = .37, ICC(2) = .74, F = 3.92 (p<.001)) were all greater than the acceptable values.

RESULTS AND DISCUSSION

Descriptive statistics

We report the means, standard deviations, correlations, and Cronbach's alpha of the study variables (Table 5). The correlations among the study variables provide initial support for the hypothesized model.

Confirmatory factor analyses

To assess the discriminant validity of the variables, we conducted a CFA on the individual- and team-level data. The results (Table 6) show that a four-factor model at the individual level ($\chi 2$ = 375.56, *df* = 314, TLI = .98, CFI = .98, RMSEA = .02) and at the team level ($\chi 2$ = 368.72, *df* = 314, TLI = .96, CFI = .96, RMSEA = .05) revealed a comparatively better fit to the data than all alternative models. Furthermore, a multilevel CFA (shared leadership and team creativity considered as team-level constructs, while other variables were individual-level) was performed. The analysis revealed ($\chi 2$ = 423.10, *df* = 343, TLI = .98, CFI = .98, RMSEA = .03) a reasonable fit to the data. These results validate the empirical distinctiveness of the variables. Additionally, the poor fit of the single-factor models at the individual level ($\chi 2$ = 1223.67, *df* = 320, TLI = .75, CFI = .77, RMSEA = .09) and team level ($\chi 2$ = 744.62, *df* = 320, TLI = .67, CFI = .70, RMSEA = .13) limit the possibility of common method variance (Podsakoff et al., 2003). Hence, these results permit us to proceed with the testing of the hypotheses.

Hypotheses testing

To test the hypothesized model, we followed the method described by Preacher, Rucker, and Hayes (2007). We tested the moderated mediation model of study 2 using mean-centered data (Aiken & West, 1991) with model 7 of the PROCESS macro (Hayes, 2013).

The results (Table 7) indicate that shared leadership is significantly related to the team climate for innovation ($\beta = .20$, $t = 2.93$, $p<.01$), thus supporting hypothesis 1. With respect to hypothesis 2, the results (Table 7) reveal a significant positive effect of the team climate for innovation on team creativity ($\beta = .43$, $t = 2.63$, $p<.01$). We found an indirect effect of shared leadership on team creativity via climate for innovation ($\beta = .20$, $SE = .10$, $t = 2.05$, $p<.05$). Additionally, in line with hypothesis 3, the Sobel test indicated that the indirect effect of shared leadership on team creativity (effect = .09, $SE = .04$, $z = 1.97$, $p<.05$, 95% CI [.03 - .20]) via a climate for innovation was significantly positive. The bootstrap confidence interval did not contain zero, providing support for the mediation effect.

We further predicted that task uncertainty increased the positive effect of shared leadership on a climate for innovation. In support of hypothesis 4, the results (Table 7) confirm that shared leadership significantly interacts with task uncertainty to foster a climate for innovation ($\beta = .16$, $t = 2.74$, $p<.01$). These findings are in line with the results of study 1, which validates and increases the generalizability of the results of study 1. We used the Aiken and West (1991) approach to plot the interaction between shared leadership and task uncertainty on a climate for innovation (Figure 3). In line with hypothesis 4, the simple slopes analysis revealed that the relationship between shared leadership and climate for innovation was significant at a high level of task uncertainty ($\beta = .36$, $t = 3.77$, $p<.001$), but this relationship became insignificant at a low level of task uncertainty ($\beta = .04$, $t = .57$, ns). These results support hypothesis 4.

Finally, regarding hypothesis 5, the results (Table 8) reveal that the indirect effect of shared leadership on team creativity via a climate for innovation is strongest when team members perceive task uncertainty (β = .15, SE = .07, 95% CI [.03, .30]). Additionally, the index of moderated mediation (index = .07, SE = .03, 95% CI [.01, .14]) further supports hypothesis 5.

Overall, in study 2, we validated the findings of study 1. We found that task uncertainty significantly moderates the link between shared leadership and climate for innovation. We further found that high levels of task uncertainty in teams strengthens the positive effect of shared leadership on a team climate for innovation and, in turn, team creativity.

GENERAL DISCUSSION

In this research, we examined the effect of shared leadership on a team climate for innovation and, subsequently, team creativity. The results from two studies show that shared leadership is positively related to a team climate for innovation, which is strengthened when there is a high level of task uncertainty. The results further reveal that shared leadership is indirectly related to team creativity through a team climate for innovation. This study makes several important contributions to the literature on shared leadership and the climate for innovation.

Theoretical contributions

First, although previous studies have found a positive effect of formal leadership on a team climate for innovation (Eisenbeiss et al., 2008; Gil et al., 2005; Pirola-Merlo et al., 2002), studies that focus on the role of shared leadership within the team climate literature are nascent. This absence is somewhat surprising because team members have an important effect on team processes and creativity (Kukenberger & D'Innocenzo, 2020; Lewis, 2004; Li et al., 2020) and provide an important source of social information (Chen, Takeuchi, & Shum, 2013; Shenghui

Wang et al., 2020) that can shape the team climate. This dearth of research is particularly concerning when considering that shared leadership has a stronger effect on team processes and outcomes than centralized leadership (Chiu et al., 2016; Pearce et al., 2008). Despite this, there has been no concerted effort to link shared leadership with a team climate for innovation. This is problematic because it ignores the fact that the influence of team members on each other is at least comparable to, if not greater than, the influence of a formal leader (Chiaburu & Harrison, 2008) and that an innovative team climate may emerge from informal team leadership structures (i.e., shared leadership). Drawing upon SIP theory (Salancik & Pfeffer, 1978), we theoretically and empirically establish the pivotal role of shared leadership in shaping a team climate for innovation. The results of both studies indicate that shared leadership provides an important source of social information (i.e., innovative vision, participative safety, task orientation, support for innovation) within the team environment, which is instrumental in fostering a climate for innovation. This finding expands our understanding of the forms of leadership that may affect the team climate by revealing that shared leadership is critical to shaping a team climate for innovation.

Second, prior research on shared leadership has largely focused on team-level outcomes directly or indirectly through behavioral, motivational, and cognitive factors (e.g., team potency, professional identity salience) (Hoch, 2013; Liu et al., 2014; Wu & Chen, 2018). However, less emphasis has been devoted to the mediating effect of team climate (Chiu et al., 2016; He et al., 2020). Specifically, the team climate in which shared leadership operates has received little attention to date. Consistent with research that shows that one of the functions of shared leadership is to create a social team environment that supports creative thinking, risk-taking, and idea sharing (Martin et al., 2018; Zhang et al., 2012), we provide important insights into how

shared leadership enhances team creativity by revealing the mediating effect of a team climate for innovation. Our two-study investigation demonstrates that shared leadership enhances team creativity by shaping a team climate for innovation. To the best of our knowledge, this is the first study to link shared leadership with team creativity via a team climate for innovation. As such, we shed light on the connection between shared leadership and team creativity with a social lens that underscores the mediating role of a team climate for innovation.

Third, we identify task uncertainty as an important contextual factor that moderates the strength of the relationship between shared leadership and a team climate for innovation. Thus, we respond to calls for research to investigate the boundary conditions that illuminate the effect of shared leadership (Serban & Roberts, 2016; Zhu et al., 2018). While previous research has mainly identified personality traits and competencies as boundary conditions of shared leadership (Chiu et al., 2016; Martin et al., 2018), we extend this research by considering the complex dynamic context in which many work teams operate, which is critical to understand how shared leadership affects the team. Based on SIP theory (Salancik & Pfeffer, 1978), we investigate the amplifying effect of task uncertainty on the relationship between shared leadership and a climate for innovation. Our findings indicate that high levels of task uncertainty strengthen the positive effect of shared leadership on a team climate for innovation because members feel motivated to seek out social information to help them work in uncertain contexts. As such, team members acquire social information about the behavioral expectations that manifest from shared leadership, which results in a stronger climate for innovation and greater team creativity. Therefore, the results of our moderated mediation model reveal that task context is important such that task uncertainty enhances the positive effect of shared leadership on a team climate for innovation and team creativity. These findings not only confirm the

effectiveness of shared leadership but also highlight the mediating and moderating conditions that facilitate team creativity.

Fourth, we move beyond the dominant lens that draws on SIP theory within the climate literature, which emphasizes the role of centralized leadership as a focal source of social information (Chiu et al., 2016; Yang et al., 2019). We contribute to this literature by showing that the observation and experiences of team members, through leader-follower dynamics, serve as a key source of social information. Our study provides empirical support for the notion that a predominant focus on centralized leadership, as a key source of social information, limits the scope of the application of this theory in climate research. We demonstrate that there are other important sources of social information, such as information that derives from team members, which help to explain how perceptions of team climate are developed from a social information processing standpoint.

Lastly, we would like to note that while both studies provide support for the hypothesized relationships, there is some variation in the correlations among the key variables. For example, as shown in Tables 1 and 5, shared leadership has a stronger correlation with climate for innovation (r = .48**) and team creativity (r = .54**) in study 1 compared to the correlations between shared leadership and climate for innovation (r = .34**) and team creativity (r = .38**) in study 2. Moreover, the regression results reveal slight variation in the effect of the predictors, which includes the indirect effect of shared leadership on team creativity via a climate for innovation in study 1 and 2. We speculate that these differences are susceptible to external factors, such as national culture and industry type, because research has consistently noted that these factors have significant implications for leadership and employees' experience (Carson, 2005; Koo & Park, 2018; Salk & Brannen, 2000). Despite the generalizability of our findings

across different contexts, this variation suggests that national culture and industry type may affect leadership dynamics and team perceptions and behaviors. Our results therefore encourage scholars and practitioners to attend to the potentially dynamic role that national culture and industry may play in influencing the effectiveness of shared leadership. Future research is encouraged to pinpoint how national culture may influence shared leadership and how different industries might distinctly benefit from shared leadership.

Practical implications

Our findings corroborate research that shows that patterns of shared leadership are useful in enhancing team creativity (Klasmeier & Rowold, 2020). The results of our studies provide evidence that shared leadership should be leveraged to enhance team creativity by creating a climate that is focused on innovation. Formal leaders should consider promoting shared leadership by encouraging team members to develop shared leadership structures. For example, particular leadership styles (e.g., participative leadership, transformational leadership) are associated with the use of shared leadership because followers learn to involve others when leadership is shared by their formal leaders (Chiu et al., 2016). Formal leaders may therefore involve their followers in team decisions and delegate leadership roles within their team to encourage shared leadership. Moreover, since the characteristics of team members also influence shared leadership (Kukenberger & D'Innocenzo, 2020), HR may seek to support line managers in creating more diverse teams (e.g., proactive personality, cognitive diversity) when seeking to encourage shared leadership structures.

Our findings further suggest that a climate for innovation is an important mechanism through which shared leadership is linked to team creativity. Therefore, leaders are encouraged to help team members embrace shared leadership to signal that collaboration and creative

thinking are encouraged. Leaders should further seek to create a psychologically safe environment where team members feel safe sharing their ideas and engaging in creative risk-taking (Chen, Wang, Zhou, Chen, & Wu, 2017). However, the literature also indicates that team norms form quickly at the earliest stages of team development through reciprocal and unconscious social processes among team members (Eisenbeiss et al., 2008). Since shared team norms that are formed at the early stages of team development are difficult to modify (MacNeil & Sherif, 1976), team members should seek to foster a climate for innovation during the team formation phase.

Our study also examined the effect of task uncertainty in strengthening the effect of shared leadership on a team climate for innovation. When a team faces significant complexity, team members may be more willing to engage in shared leadership to create a supportive climate (Morgeson et al., 2009). In such contexts, team members may face unclear task information, which may lead team members to seek guidance and support from one another (Wang et al., 2014). Therefore, we recommend that formal leaders assess the task environment of the team to identify whether it is a suitable context in which to benefit from shared leadership. Because shared leadership provides more value in an ambiguous, complex, and uncertain task environment, we encourage formal team leaders to motivate team members to engage in shared leadership in these contexts. In this way, organizations can derive more creative benefits from shared leadership in teams that experience task uncertainty.

Limitations and future research directions

Despite the strengths of our study, there are several limitations. First, this study considered only the effect of shared leadership. However, SIP theory (Salancik & Pfeffer, 1978) suggests that team members may be exposed to several sources of social information, such as

information from formal leaders (Yang et al., 2019). Although we controlled for the effect of formal leadership, we recommend that future research incorporate variables related to both formal and informal leadership within a single conceptual model to better understand the effect of each style of leadership in shaping a climate for innovation. The importance of this future research is underscored by the fact that leadership within teams often comprises both formal and informal leadership. The inclusion of formal leadership variables with research on shared leadership may provide a more comprehensive understanding of the antecedents of a climate for innovation from a leadership standpoint. Second, although we theorized that a team climate for innovation mediates the effect by which shared leadership influences team creativity, there are likely other climate-related factors (e.g., creative climate, climate for excellence) that may provide fruitful insights into the effect of shared leadership on team outcomes. Third, although we measured creativity through objective and subjective measures, which increased the validity of the results, we were unable to secure access to the original data related to the creativity rewards in study 2. Because of this, we encourage future research to use real monetary data to provide an alternative assessment of team creativity. Alternatively, future research may use an archive of employees' creative ideas (Hughes et al., 2018), which may provide a better understanding of the benefits of adopting shared leadership by providing a true objective picture of the unique creative contributions of team members. Overall, while this research provides important and novel insights into the literature on shared leadership and a climate for innovation, we encourage future research to better delineate the conditions under which shared leadership generates more useful and novel ideas within the team context.

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Table 1. Descriptive statistics and correlations among study variables (Study 1)

Variable	M	SD	1	2	3	4	5	6	7	8	9
1. Shared leadership	3.46	0.65	-								
2. Climate for innovation	4.29	0.74	0.48**	(0.96)							
3. Task uncertainty	3.56	0.73	0.08	0.04	(0.85)						
4. Team creativity	3.99	0.76	0.54**	0.58**	-0.15	(0.95)					
5. Transformational leadership	3.67	0.67	0.14	0.29*	0.12	0.34*	(0.93)				
6. Team autonomy	3.47	0.51	0.02	0.31*	0.05	0.21	.341*	(0.86)			
7. Team size	4.85	0.99	-0.04	-0.12	0.03	-0.01	0.07	-0.28	-		
8. Team tenure	2.90	0.83	-0.13	0.01	0.05	-0.05	0.26	0.18	0.03	-	
9. Leader tenure	2.38	0.84	-0.33*	-0.08	-0.13	-0.20	0.12	0.02	0.04	0.64**	-

Note: N = 48; *p<.05, **p <.01; Cronbach's alpha is the bracketed value on the diagonal cells.

Table 2. Alternative model test results (Study 1)

	Model	$\chi 2$	*df*	TLI	CFI	RMSEA
Individual-level data	1: Four-factor model (climate for innovation, task uncertainty, team autonomy, transformational leadership)	158.54	97	0.97	0.98	0.05
	2: Three-factor model (combined climate for innovation and task uncertainty)	460.17	100	0.85	0.88	0.13
	3: Two-factor model (combined climate for innovation, task uncertainty, and team autonomy)	821.02	102	0.71	0.75	0.17
	4: One-factor model (merged all variables)	1564.11	103	0.42	0.50	0.25
Team-level data	1: Five-factor model (climate for innovation, task uncertainty, team creativity, team autonomy, transformational leadership)	241.087	181	0.938	0.951	0.084
	2: Four-factor model (combined climate for innovation and task uncertainty)	370.709	185	0.812	0.85	0.146
	3: Three-factor model (combined climate for innovation, task uncertainty, and team creativity)	516.342	188	0.674	0.734	0.193
	4: Two-factor model (combined climate for innovation, task uncertainty, team creativity, and team autonomy)	637.172	190	0.56	0.638	0.224
	5: One-factor model (combined all variables)	830.741	191	0.374	0.482	0.267

Table 3. Regression results for the overall model and moderation effect (Study 1)

Outcome variable	**Climate for innovation**				**Team creativity**			
	Effect	**SE**	**t**	**R^2**	**Effect**	**SE**	**t**	**R^2**
Constant	0.08	0.76	0.10	0.41	0.04	0.66	0.05	0.47
Shared leadership	0.44	0.13	3.46***		0.28	0.13	2.23*	
Task uncertainty	0.12	0.14	0.81		-	-	-	
Shared leadership x task uncertainty	0.29	0.14	2.05*		-	-	-	
Climate for innovation	-	-	-		0.34	0.13	2.54**	
Transformational leadership	0.13	0.14	0.87		0.19	0.13	1.47	
Team autonomy	0.26	0.15	1.73		0.04	0.13	0.30	
Team size	-0.01	0.13	-0.06		0.05	0.11	0.41	
Team tenure	-0.16	0.20	-0.80		-0.03	0.17	-0.17	
Leader tenure	0.17	0.20	0.84		-0.07	0.17	-0.43	

Note: N = 48; Bootstrap sample size = 20,000. *p <.05, **p <.01, ***p<.001.

Table 4. Conditional indirect effect of shared leadership on team creativity via a climate for innovation at low and high values of task uncertainty (Study 1)

Conditional indirect effect at M ± SD	**Values of task uncertainty**	**Indirect effect**	**SE**	**95%CI - LL**	**95%CI - UL**
Team creativity	-SD	0.06	0.08	-0.13	0.21
Team creativity	M	0.15	0.07	0.02	0.31
Team creativity	+SD	0.24	0.10	0.04	0.46

Note: N = 48; Bootstrap sample size = 20,000; CI = Confidence interval, LL = Lower limit, UL = Upper limit.

Table 5. Descriptive statistics and correlations among study variables (Study 2)

Variable	M	SD	1	2	3	4	5	6	7	8	9
1. Shared leadership	3.77	0.32	-								
2. Climate for innovation	4.36	0.35	0.34**	(0.78)							
3. Task uncertainty	3.83	0.41	0.21	0.20	(0.78)						
4. Team creativity	2.83	1.19	0.38**	0.37**	0.06	-					
5. Transformational leadership	3.88	0.42	0.26*	0.30**	0.19	0.32**	(0.87)				
6. Team autonomy	2.58	0.79	0.18	0.05	-0.02	0.55**	0.20	(0.81)			
7. Team size	4.90	0.86	0.06	-0.09	-0.14	-0.12	-0.16	-0.11	-		
8. Team tenure	2.99	1.23	0.06	0.09	-0.09	-0.11	-0.06	-0.20	-0.14	-	
9. Leader tenure	2.64	1.09	0.02	0.02	-0.13	-0.15	-0.10	-0.09	-0.08	0.79**	-

Note: N = 78; *p <.05, **p <.01; Cronbach's alpha is bracketed value on the diagonal cells.

Table 6. Alternative model test results (Study 2)

	Model	$\chi 2$	*df*	TLI	CFI	RMSEA
Individual-level data	1: Four-factor model (climate for innovation, task uncertainty, team autonomy, transformational leadership)	375.56	314	0.98	0.98	0.02
	2: Three-factor model (combined climate for innovation and task uncertainty)	474.79	317	0.97	0.96	0.04
	3: Two-factor model (combined climate for innovation, task uncertainty, and team autonomy)	911.43	319	0.84	0.85	0.07
	4: One-factor model (merged all variables)	1223.67	320	0.75	0.77	0.09
Team-level data	1: Four-factor model (climate for innovation, task uncertainty, team autonomy, transformational leadership)	368.72	314	0.96	0.96	0.05
	2: Three-factor model (combined climate for innovation and task uncertainty)	414.97	317	0.92	0.93	0.06
	3: Two-factor model (combined climate for innovation, task uncertainty, and team autonomy)	624.16	319	0.76	0.79	0.11
	4: One-factor model (merged all variables)	744.62	320	0.67	0.70	0.13

Table 7. Regression results for the overall model and moderation effect (Study 2)

Outcome variable	**Climate for innovation**				**Team creativity**			
	Effect	**SE**	**t**	**R^2**	**Effect**	**SE**	**t**	**R^2**
Constant	-0.22	0.44	-0.50	0.27	0.48	0.60	0.81	0.48
Shared leadership	0.20	0.07	2.93**		0.20	0.10	2.05*	
Task uncertainty	0.16	0.08	2.04*		-	-	-	
Shared leadership x task uncertainty	0.16	0.06	2.74**		-	-	-	
Climate for innovation	-	-	-		0.43	0.16	2.63**	
Transformational leadership	0.15	0.07	2.01*		0.08	0.11	0.74	
Team autonomy	-0.01	0.07	-0.15		0.52	0.10	5.25***	
Team size	-0.01	0.07	-0.07		-0.06	0.10	-0.53	
Team tenure	0.09	0.08	1.14		0.08	0.12	0.66	
Leader tenure	-0.03	0.09	-0.30		-0.17	0.13	-1.29	

Note: N = 78; Bootstrap sample size = 20,000; *p <.05, **p <.01, ***p <.001.

Table 8. Conditional indirect effect of shared leadership on team creativity via a climate for innovation at low and high values of task uncertainty (Study 2)

Conditional indirect effect at M ± SD	**Values of task uncertainty**	**Indirect effect**	**SE**	**95%CI - LL**	**95%CI - UL**
Team creativity	-SD	0.02	0.03	-0.03	0.10
Team creativity	M	0.09	0.04	0.02	0.19
Team creativity	+SD	0.15	0.07	0.03	0.30

Note: N = 78; Bootstrap sample size = 20,000; CI = Confidence interval, LL = Lower limit, UL = Upper limit.

Fig. 1. Proposed theoretical model

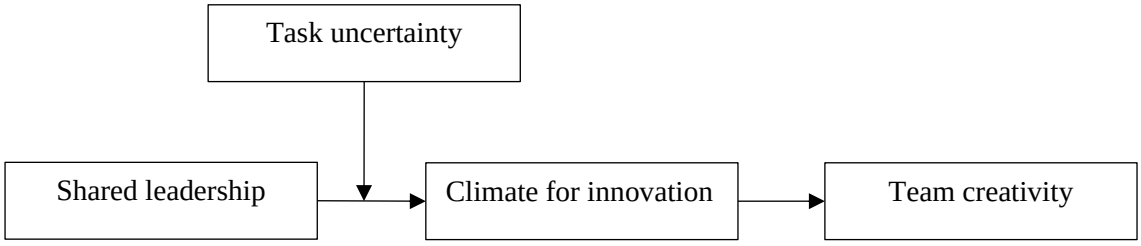


Fig. 2. Interaction between shared leadership and task uncertainty on climate for innovation (Study 1)

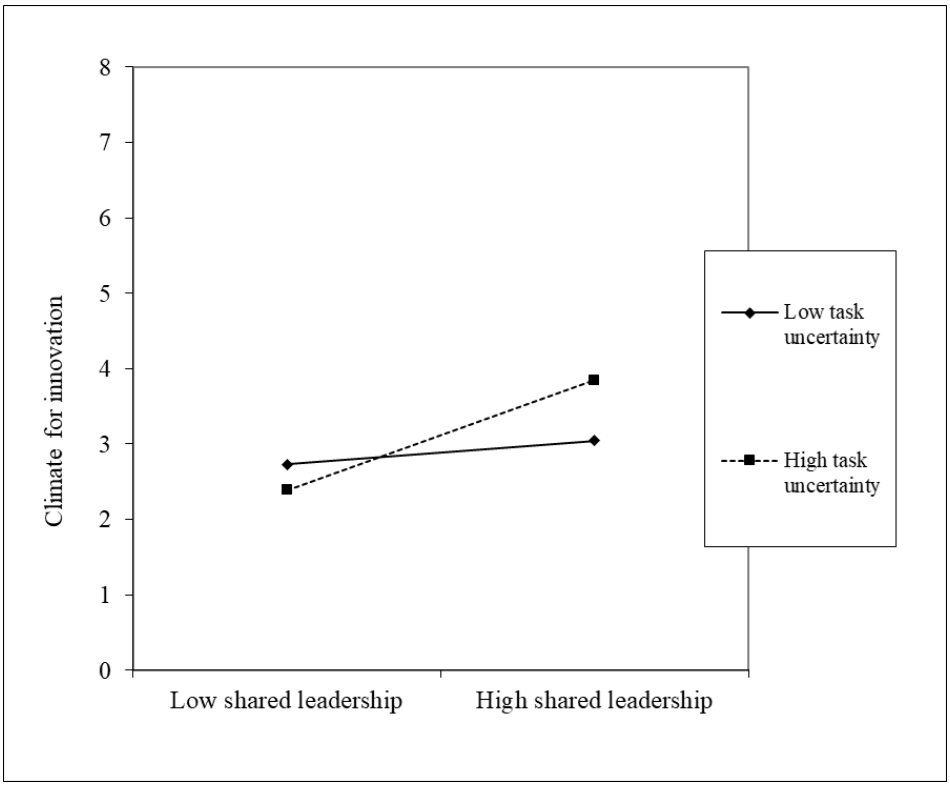
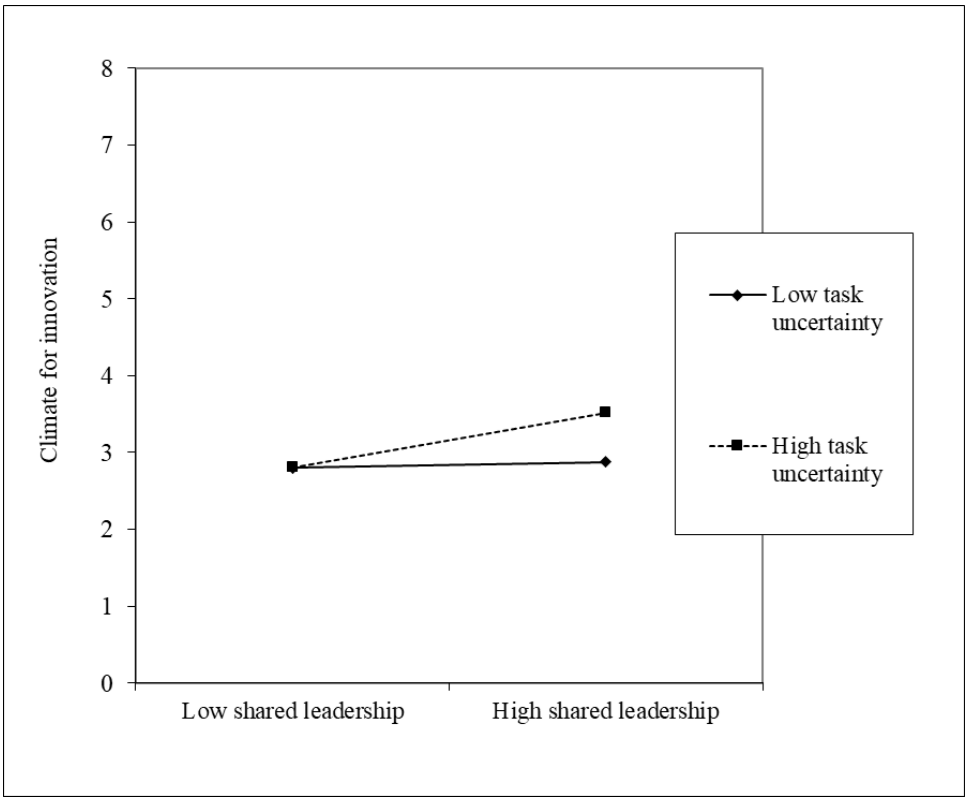


Fig. 3. Interaction between shared leadership and task uncertainty on climate for innovation (Study 2)



Appendix A. Measurement items

Variable		Item	Study
Shared leadership (SL)	SL-density measure	According to the given name list of your team members, please indicate your perception about each member on the following statement: To what degree does your team rely on this individual for leadership?	Study 1 and 2
Climate for innovation (CFI)	CFI-1	In my team, members are supported for developing new ideas, regardless of the eventual success/failure of these ideas	Study 1
	CFI-2	In this team, members are supported for testing new ideas, regardless of the eventual success/failure of these tests	
	CFI-3	In my team, creation and sharing of new knowledge is supported	
	CFI-4	In my team, failures and setbacks are tolerated by management	
	CFI-5	In my team, there is space to experiment with new ideas	
Task uncertainty (TU)	TU-1	There is a clearly defined body of knowledge or subject matter that members use to guide our work on this project (reverse-coded)	Study 1 and 2
	TU-2	Team members understand the sequence of steps that we can follow to complete this project (reverse-coded)	
	TU-3	It is clear to my team members what the outcome of this project will look like (reverse-coded)	
Team creativity (TC)	TC-1	My team members' work is original, adaptive, and practical	Study 1
	TC-2	My team members generate creative ideas	
	TC-3	My team members promote and champion ideas to others	
	TC-4	My team members come up with creative solutions to problems	
	TC-5	My team members search out new technologies, processes, techniques, and/or product ideas	
	TC-6	My team members investigate and secure resources needed to implement new ideas	
Climate for innovation		Please indicate your opinion about the following statements among your team:	Study 2
• Vision (V)	V-1	Agreement with the objectives	
	V-2	Team's objectives clearly understood	
	V-3	Team's objectives achievable	
	V-4	Worth of the objectives to the organization	
	PS-1	'We are together' attitude	

• Participative safety (PS)	PS-2	People keep each other informed	
	PS-3	People feel understood and accepted	
	PS-4	Real attempts to share information	
• Task orientation (TO)	TO-1	Preparedness to basic questions	
	TO-2	Critical appraisal of weaknesses	
	TO-3	Building on each other's ideas	
• Support for innovation (SFI)	SFI-1	Search for new ways of looking at problems	
	SFI-2	Time taken to develop ideas	
	SFI-3	Cooperation in developing and applying ideas	
Autonomy (AU)	AU-1	The job gives our team a chance to use our personal initiative or judgment in carrying out the work	Study 1 and 2
	AU-2	The job allows us to make a lot of decisions by our team members	
	AU-3	The job provides us with significant autonomy in making decisions	
Transformational leadership (TFL)	TFL-1	Our leader communicates a clear and positive vision of the future	Study 1 and 2
	TFL-2	Our leader treats team members as individuals, supports and encourages their development	
	TFL-3	Our leader gives encouragement and recognition to team members	
	TFL-4*	Our leader fosters trust, involvement and cooperation among team members	
	TFL-5	Our leader encourages thinking about problems in new ways and questions assumptions	
	TFL-6*	Our leader is clear about his/her values and practices what he/she preaches	
	TFL-7	Our leader instils pride and respect in others and inspires team members by being highly competent	

Note: * Two items were removed due to low factor loadings from study 1 analysis