Cognitive diversity and team creativity: Effects of team intrinsic motivation and transformational leadership

Xiao-Hua (Frank) Wang a,1, Tae-Yeol Kim b,2, Deog-Ro Lee c,*

a Department of Organization and Human Resources, School of Business, Renmin University of China, Beijing 100872, China
b China Europe International Business School, 699 Hongfeng Road, Pudong, Shanghai 201206, China
c School of Business, Seowon University, 241 Musimseoro, Heungdeok-gu, Cheongju, Chungbuk 361-742, South Korea

ARTICLE INFO

Article history:
Received 19 June 2014
Received in revised form 19 February 2016
Accepted 22 February 2016
Available online 9 March 2016

Keywords:
Cognitive diversity
Team creativity
Transformational leadership
Team intrinsic motivation

ABSTRACT

We theorized and tested an integrated model for the relationship between cognitive diversity and team creativity. This model involves team intrinsic motivation as a mediator and transformational leadership as a moderator. The Hierarchical Linear Modeling results using 62 teams revealed that transformational leadership moderated cognitive diversity’s direct effect on team intrinsic motivation and indirect effect on team creativity via team intrinsic motivation, such that the effects were positive when transformational leadership was high, but negative when transformational leadership was low.

Article history:
Received 19 June 2014
Received in revised form 19 February 2016
Accepted 22 February 2016
Available online 9 March 2016

Keywords:
Cognitive diversity
Team creativity
Transformational leadership
Team intrinsic motivation

1. Introduction

Rapid technological development and intense global competition have made organizations increasingly reliant on creativity to survive and succeed (Gumusluoglu & Ilsev, 2009; Hennessey & Amabile, 2010; Yoshida, Sendjaya, Hirst, & Cooper, 2014). Teams have also been widely used in the workplace, which explains the rapid growth of literature on team creativity (e.g., Baer, Leenders, Oldham, & Vadera, 2010; Farh, Lee, Yoshida, Sendjaya, Hirst, & Cooper, 2014). Teams have also been widely used in the workplace, which explains the rapid growth of literature on team creativity (e.g., Baer, Leenders, Oldham, & Vadera, 2010; Farh, Lee, Yoshida, Sendjaya, Hirst, & Cooper, 2014).

Transformational leadership refers to the process by which a leader inspires and motivates followers to go beyond what is minimally expected of them (Bass & Avolio, 1990). Transformational leadership has been found to positively influence team creativity (Hülsheger, Anderson, & Cooper, 2010; Lee, 2010). However, the role of cognitive diversity in the relationship between team intrinsic motivation and team creativity has received less attention. This is surprising, given that cognitive diversity has been shown to have a positive impact on team creativity (e.g., Borrill, Amir, Haward, & West, 2006; Shin & Zhou, 2007; Somech, 2006). Evidence has shown that, under certain supportive contexts, teams composed of employees with differing functional or educational backgrounds tend to be more creative. However, it is not always feasible for organizations to form cross-functional teams to take on all the innovation challenges. Many managers are facing the daunting task of stimulating creativity within their seemingly “homogeneous” teams. Indeed, many teams in organizations are composed of members with similar educational or functional backgrounds, but are also expected to generate creative ideas or innovative solutions to problems. Van Knippenberg and Schippers (2007) have called for more research that examines how those seemingly less “heterogeneous” teams (e.g., teams with similar educational or functional backgrounds) manage to deliver creative team results.

Recent research on diversity and creativity (Hoever, van Knippenberg, van Ginkel, & Barkema, 2012; Kurtzberg, 2005) has shown that any team can have great potential for creativity if the team members possess or perceive high cognitive diversity, defined as perceived differences in thinking styles, knowledge, skills, values, and beliefs among team members (Kilduff, Angelmar, & Mehr, 2000; Van der Vegt & Janssen, 2003). According to the “value in diversity” perspective, team diversity allows members to pool information, combine ideas, and integrate perspectives, so that they can generate synthetic solutions to work-related problems (Williams & O’Reilly, 1998). Cognitive diversity can serve as a prerequisite condition for perspective integration and idea integration, because
it brings in a wide range of knowledge, skills, ideas, and values (Shin, Kim, Lee, & Bian, 2012; Van der Vegt & Janssen, 2003). Also, even team members with similar educational and functional backgrounds can have different knowledge, skills, ideas, and values. Thus, cognitive diversity is more conceptually relevant to team creativity than other diversity dimensions such as demographic diversity, and can promote creativity even in teams whose members have similar educational or functional backgrounds. The primary purpose of our study is to investigate why, when, and how team cognitive diversity contributes to team creativity.

Two experimental studies have linked cognitive diversity with team creativity. Kurtzberg (2005) found that teams with high cognitive diversity, referring to team members’ differences in their problem-solving approaches in this study, generated more creative ideas than homogenous teams. Hoever et al. (2012) found that diversity of perspectives has a positive effect on team creativity when team members are instructed to take others’ perspectives, and that such moderation effect is mediated by team information elaboration. The present study continues this line of research, but advances the literature on cognitive diversity and team creativity in several ways.

First, previous studies have operationalized cognitive diversity as the extent to which members differ on one attribute (e.g., the problem-solving approach) (Kurtzberg, 2005) or on their assigned functional roles in the experiment (e.g., artistic manager vs. finance manager) (Hoever et al., 2012). By definition, cognitive diversity refers to the perceived differences among team members in a variety of different attributes (Van der Vegt & Janssen, 2003). Thus, our study adopts a broader scope of cognitive diversity and measures team members’ perceived differences in such attributes as thinking styles, knowledge, skills, values, and beliefs. To fully understand the effect of cognitive diversity on team creativity in real working teams, it is important to consider the different cognitive aspects simultaneously.

Second, those studies have yet to examine the motivational mechanism through which cognitive diversity is transmitted to team creativity. Van Knippenberg, De Dreu, and Homan (2004) contend that effective team processes are contingent on team motivation, suggesting that diverse teams may actualize the potential benefits for creative performance only when team motivation is high. However, we still do not know how cognitive diversity is associated with team motivation. In order to fill this gap, this study focuses on team intrinsic motivation, defined as the extent to which team members enjoy performing a team task for itself and experience the pleasure and satisfaction inherent in the task. According to Amabile’s (1996) componential theory of creativity, intrinsic motivation is the motivational mechanism of creativity or creative performance. Drawing on early theories (Amabile, 1996; Chiang, Hu, & Hung, 2014; Deci & Ryan, 1985), we extend individual intrinsic motivation to the team level due to their functional equivalence (Morgeson & Hofmann, 1999), and consider team intrinsic motivation as a shared motivational state within a team through which the members utilize their cognitive diversity to achieve team creativity.

Third, prior studies on cognitive diversity and team creativity (Hoever et al., 2012; Kurtzberg, 2005) have not examined the influence of leadership. Managing a diverse team could be challenging, because diversity might create conflicts and tension among members due to their different views and perspectives (Mohammed & Angell, 2004; Pelled, Eisenhardt, & Xin, 1999). As a result, team leaders can play an important role in translating team members’ cognitive diversity into positive team motivation (Van Knippenberg et al., 2004). Van Knippenberg and Schippers (2007) also recommend that researchers give more attention to the moderating role of leadership in studying the effects of cognitive diversity. Despite the importance of leadership in managing cognitive diversity, the interplay between leadership and cognitive diversity remains largely unexplored (Jackson, Joshi, & Erhardt, 2003). Thus, this study aims to explore the moderation effect of transformational leadership in the relationship between cognitive diversity and team intrinsic motivation (and team creativity). Transformational leadership encourages employees to transcend their self-interests for the good of the team and the organization, pushes them to address higher-order needs, and enables them to achieve performance beyond expectations (Bass & Riggio, 2006). Transformational leaders act as role models, provide inspirational motivation and intellectual stimulation, and show individualized consideration to followers (Wang & Howell, 2010). When leaders highly encourage employees to focus on the good of the team and organization and stimulate them intellectually, we expect that employees will be more likely to enjoy working with people who have different knowledge and views, and thus produce more creative ideas.

By proposing and testing this integrated model, we aim to extend our knowledge with regard to how, when and why cognitive diversity affects team creativity. Fig. 1 depicts our conceptual model.

2. Theory and hypothesis development

2.1. Cognitive diversity and team creativity

The “value in diversity” perspective (Williams & O’Reilly, 1998) posits that cognitive diversity may provoke team creativity because exposure to different or divergent perspectives may stimulate team members to generate more innovative ideas. Also, information and decision-making theories (De Dreu, Nijstad, & Van Knippenberg, 2008; De Dreu & West, 2001) suggest that cognitive diversity brings in a wide range of knowledge, skills, abilities and ideas to the team that are distinct and non-redundant. Such a broad range of knowledge and abilities can then produce more new choices, plans, and products. In addition, members with different thinking styles and value systems can use different perspectives to scan the environment and process information, thereby helping the team analyze problems using diverse angles and consider several possible alternatives (Gilson, Lim, Luciano, & Choi, 2013). As a result, those teams may be expected to make better decisions and generate more creative ideas than teams with low cognitive diversity (Jackson, May, & Whitney, 1995; Kurtzberg, 2005). Therefore, we hypothesize:

**Hypothesis 1.** Cognitive diversity is positively related to team creativity.

2.2. Cognitive diversity and team intrinsic motivation

Prior studies linking diversity with team creativity have mainly focused on members’ task-related activities as mediators that translate
cognitive diversity into team creativity, such as information elaboration (Hoever et al., 2012; Kearney & Gebert, 2009), team learning (Van der Vetg & Bunderson, 2005), and team reflection (Somech, 2006). A key assumption of those studies is that team members must be motivated to engage in those task-relevant activities. However, the mediation role of team motivation has been largely neglected in the diversity literature (Van Knippenberg et al., 2004). To fill this gap, this study focuses on team intrinsic motivation as the motivation-oriented mechanism explicating the effect of cognitive diversity on team creativity. According to Amabile’s (1996) componential theory of creativity, intrinsic motivation is one of the most important mechanisms through which external factors result in individual or team creativity (Shalley, Zhou, & Oldham, 2004; Shin & Zhou, 2003). Intrinsic motivation is the motivation to complete a task or solve a problem because it is interesting, challenging, and satisfying. Based on Amabile’s theory, we examine the mediating role of team intrinsic motivation in the team creativity process. Paulus (2000) posited that team motivation is a crucial precondition for diverse teams to initiate productive team processes (e.g., idea exchange or information elaboration) and fulfill their creative potential. Chen and Kanfer (2006) defined team motivation as shared beliefs among members regarding various aspects of their tasks and capabilities. Such shared beliefs originate from individual motivation and are formed through constant interaction and communication among team members (Morgeson & Hofmann, 1999).

Recent studies show that team motivation may be understood by generalizing individual-level motivation constructs and theories to the team level. For example, collective efficacy, the team-level analog of individual self-efficacy, captures the shared belief among team members that the team can accomplish specific tasks (Bandura, 1997). Team empowerment, the team-level analog of psychological empowerment, reflects a team’s shared belief in its autonomy and capability to perform meaningful work that affects the organization (Kirkman & Rosen, 1999). In a similar vein, we contend that individual and team intrinsic motivations are functionally equivalent (Morgeson & Hofmann, 1999), such that team intrinsic motivation has a similar effect on team creativity as does individual intrinsic motivation on individual creativity. Team intrinsic motivation originates from individual intrinsic motivation, and is shaped in the process of ongoing interaction, coordination, and collaboration among members within the same team (Morgeson & Hofmann, 1999). Individual intrinsic motivation is an individual’s perception of and experience with a task (Deci & Ryan, 1985). Individuals’ perceptions and beliefs about work tasks can be influenced and reinforced by other team members. Through constant information sharing, opinion exchange, and collective sense-making, team members may develop a normative belief about the task they are performing (Levine & Moreland, 1991; Morgeson & Hofmann, 1999). The team members may reach a consensus that it is intrinsically rewarding to conduct their task and to find solutions or creative ideas for complex problems associated with the task. Hence, the team members, as a whole, may enjoy performing the team task for itself and experience the pleasure and satisfaction inherent in the task.

We propose that cognitive diversity is positively related to team intrinsic motivation. According to cognitive evaluation theory (Deci & Ryan, 1985), contextual factors contribute to intrinsic motivation if they provide relevant information or feedback that confirms an individual’s feeling of competence. Cognitive diversity broadens the ability and skill repertoire of the team, thereby enhancing team members’ sense of competence by enabling them to analyze problems from different angles and by stimulating innovative solutions (Amabile, 1996). The higher a team’s cognitive diversity, the more likely its members will hold unique and indispensable information, knowledge, and perspectives relevant to their tasks. When team members are exposed to the different preferences and opinions held by others, they must engage in systematic information processing, characterized by deeper and elaborate dissemination as well as integration of knowledge and information among team members (De Dreu et al., 2008). During this process, members may be inspired by one another and feel more competent in their team’s ability to generate solutions to problems. As a result, they may develop a shared belief that it is intrinsically rewarding to work together on the group tasks. Hence, we propose the following:

**Hypothesis 2.** Cognitive diversity is positively related to team intrinsic motivation.

2.3. Team intrinsic motivation and team creativity

As stated above, Amabile’s (1996) componential theory of creativity contends that intrinsic motivation is one of the key contributors to creativity. Previous research (Shin & Zhou, 2003; Tierney, Farmer, & Graen, 1999) has supported the importance of intrinsic motivation in the individual-level creativity process. Drawing on Amabile’s theory, Milliken, Bartel, and Kurtzberg (2003) proposed that collective emotional engagement is an important mechanism through which team diversity is transmitted to team creativity. Collective emotional engagement is defined as a shared feeling of team members that reflect their “emotional investment in the group and their interest in engaging with members and in the task” (Milliken et al., 2003; p. 48). Collective emotional engagement is inherently consistent with team intrinsic motivation, because both constructs emphasize the internal interests of team members to perform the task and the positive emotional states arising from such interests.

We propose that team intrinsic motivation mediates the positive effect of cognitive diversity on team creativity for several reasons. First, intrinsic motivation theory (Deci & Ryan, 1985; Oldham & Cummings, 1996) suggests that situational factors, such as cognitive diversity, exert influence on creativity via intrinsic motivation. When team members feel excited about the tasks and highly engaged in the task for its own sake in a cognitively diverse team, they are more likely to explore innovative cognitive pathways, to play with different ideas, and to concentrate on the task for a longer period (McGraw & Fiala, 1982; McGraw & McCullers, 1979). Such extensive exploration and persistence thus should result in higher team creativity. Second, according to Amabile’s (1996) componential theory of creativity, intrinsically motivated team members are cognitively more flexible and are more likely to conduct divergent thinking, heuristic exploration, and even risk taking. Third, team intrinsic motivation may improve the cognitive processes of the team. Intrinsically motivated team members want to expand their knowledge bases by incorporating diverse information. They tend to openly exchange and integrate ideas, knowledge, and insights relevant to the task, which then promotes team creativity (Van Knippenberg et al., 2004). The theoretical development so far suggests that cognitive diversity influences team intrinsic motivation, which in turn helps team members engage in a higher level of creative behavior. To sum up, we hypothesize:

**Hypothesis 3.** Team intrinsic motivation mediates the positive relationship between cognitive diversity and team creativity.

2.4. The moderating role of transformational leadership

Although we generally expect a positive link between cognitive diversity and team intrinsic motivation (and team creativity), the variability observed in the relationship between cognitive diversity and creativity in the literature suggests the potential for moderators. As such, drawing on previous studies (Shin & Zhou, 2007; Somech, 2006), we propose that leadership behaviors can serve as a critical boundary condition that determines how much cognitive diversity can enhance team intrinsic motivation. Managers are facing a new challenge because organizations are increasingly relying on diverse teams to generate creative solutions to complex problems and issues (Van...
Knippenberg & Schippers, 2007). They must ensure that the creative potential of a diverse team can be realized, and that the different perspectives and expertise of team members can be fully integrated to produce superior collective outcomes.

We propose that transformational leadership serves as a catalyst that facilitates the development of team intrinsic motivation in cognitively diverse teams because it can enhance employees’ enthusiasm for the activity. Transformational leadership includes four interrelated behavioral dimensions, namely, idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration (Bass & Riggio, 2006). Each behavioral dimension can affect the relationship between cognitive diversity and team intrinsic motivation.

First, transformational leaders exert idealized influence and provide inspirational motivation via communicating an appealing collective vision. According to the self-concept theory of transformational leadership (Shamir, House, & Arthur, 1993), the collective vision enables leaders to unify diverse team members, to assign important meaning to the team’s task, and to increase the intrinsic valance of members’ efforts (Shamir et al., 1993). These leadership behaviors are expected to enhance team members’ beliefs about the values of diversity and their understanding of the proper way to deal with diversity (Van Knippenberg & Schippers, 2007). Consistent with this, Milliken et al. (2003) asserted that a common vision can unite team members with cognitive diversity and shape positive dynamics among the members. That is, transformational leadership can evoke positive feelings such as optimism and enthusiasm in cognitively diverse teams, which ultimately enhance the pleasure and satisfaction inherent to the task (Deci & Ryan, 1985).

Second, the intellectual stimulation of transformational leaders encourages team members to utilize cognitive diversity among team members in questioning their own assumptions, reframing problems, and thinking out of the box (Bass & Riggio, 2006). They are also motivated to appreciate the diverse knowledge bases and skills of others and to integrate different perspectives to generate new ideas. In addition, according to psychological empowerment theory (Spreitzer, 1995; Thomas & Velthouse, 1990), intellectual stimulation enhances the feeling of self-determination because it gives team members the freedom and autonomy to decide how they can leverage their cognitive diversity to tackle the problem in an innovative way. As a result, working in a cognitive diverse team is perceived by members as more enjoyable and interesting (Eisenbeiss, Van Knippenberg, & Boerner, 2008).

Third, transformational leaders recognize individual differences in followers, encourage followers to express their unique inputs, and listen to their followers attentively through individualized consideration (Bass & Riggio, 2006). According to social learning theory (Bandura, 1977), leaders act as role models via individualized consideration, showing their members how to handle team members with different knowledge, skills, and perspectives. By observing the modeling behavior of their leaders, team members learn to fully appreciate and build on one another’s perspectives and expertise to generate creative solutions. Thus, team members working with a high transformational leader in cognitively diverse teams may consider working together to be more enjoyable. Thus, the following hypothesis is proposed:

**Hypothesis 4.** Transformational leadership moderates the positive relationship between cognitive diversity and team intrinsic motivation, such that the relationship is stronger when transformational leadership is high rather than low.

Cumulatively, the above predictions suggest a first-stage moderation (Edwards & Lambert, 2007). Hence, we propose the following:

**Hypothesis 5.** Transformational leadership moderates the indirect effect of cognitive diversity on team creativity via team intrinsic motivation, such that the indirect relationship is stronger when transformational leadership is high rather than low.

### 3. Method

#### 3.1. Participants and procedures

We collected data from 62 R&D teams in 14 organizations in South Korea, including three pharmaceutical companies, six electronic companies, one chemical company, one information technology company, and three manufacturing companies. The third author obtained the participation of these 14 organizations, based on their inclusion in a list of companies that cooperate with his university. All R&D teams in the organizations participated in this survey. Participation was voluntary, and the respondents were assured of the confidentiality of their responses. The participating team members and their leaders completed the questionnaires during working hours. Team members reported cognitive diversity, team intrinsic motivation, and transformational leadership behavior of their leaders. Leader teams assessed team creativity. The surveys were translated into Korean following Brislin’s (1986) back-translation procedure.

Of the 478 member–team leader pair surveys distributed, 351 were returned by 68 teams, representing a response rate of 73.6%. Six teams returned the response of only two or less team members or missing values were eliminated, resulting in 346 member–team leader pair surveys across 62 teams for data analysis. A total of 29% of the employees were female. The average age of the employees was 32.6 years (SD = 6.1), and the average team tenure was 3.4 years (SD = 4.0). The team leaders had an average age of 43.6 years (SD = 4.9) and an average team tenure of 8.5 years (SD = 6.9). A total of 11% of the team leaders were female.

#### 3.2. Measures

##### 3.2.1. Cognitive diversity

Following Shin et al. (2012), we used Van der Vegt and Janssen’s (2003) four-item scale to assess cognitive diversity. These items measure team members’ perceived difference in their thinking styles, knowledge, skills, values, and beliefs (e.g., “To what extent do the members of the work group differ in their knowledge and skills?”; 1 = “To a very small extent”; 7 = “To a very large extent”).

##### 3.2.2. Transformational leadership

Transformational leadership was assessed using the Multifactor Leadership Questionnaire (MLQ) Form 5X (Avolio & Bass, 2004) [e.g., “(My leader) emphasizes the importance of having a collective sense of mission”; 1 = “Not at all”; 5 = “Frequently, if not always”]. MLQ contains 20 items (i.e., five items for the following five dimensions: charismatic attributes, charismatic behavior, inspirational motivation, intellectual stimulation, and individualized consideration). Following previous studies, we combined the five dimensions to generate a composite transformational leadership score.

##### 3.2.3. Team intrinsic motivation

To assess team intrinsic motivation, we adapted Tierney et al.’s (1999) 5-item measure of individual intrinsic motivation. We changed the focal referent from the individual level (i.e., “I”) to the team level (i.e., “our team”) (Chan, 1998). Sample items include “Our team enjoys finding solutions to complex problems” and “Our team enjoys coming up with new ideas for products” (1 = “Strongly disagree”; 7 = “Strongly agree”).

##### 3.2.4. Team creativity

Team creativity was evaluated by team leaders using Shin and Zhou’s (2007) four-item scale. Sample items include “How creative do you consider your team to be?” and “How well does your team produce new ideas?” (1 = “Poorly”; 7 = “Very much”).
3.2.5. Control variables

First, we controlled for team size and team tenure, given that these factors may affect team outcomes (Hirst, Van Knippenberg, & Zhou, 2009). Second, we controlled for task interdependence (Van der Vegt & Janssen, 2003), using Shin and Zhou’s (2007) single item, “The work I usually do is a group project rather than an individual project.” Third, following Shin and Zhou (2007), we controlled for the type of tasks performed by the teams. We created three dummy variables using Keller’s (1992) categorization of research and development tasks: basic or non-mission research, applied or mission-oriented research, new product or process development, and technical service or existing product development. Finally, to test the effects of cognitive diversity over and beyond demographic diversity, we controlled for age, sex, and organizational tenure diversity (Van der Vegt & Bunderson, 2005).

3.3. Aggregation tests

Three variables (i.e., cognitive diversity, team intrinsic motivation, and transformational leadership) were measured at the individual level and then aggregated to the team level. We calculated the within-group inter-rater agreement (rwg) and the inter-member reliability (ICC(1) and ICC(2)) for the three variables: Cognitive diversity, median rwg = .87, ICC(1) = .16, ICC(2) = .62; team intrinsic motivation, median rwg = .81, ICC(1) = .20, ICC(2) = .60; and transformational leadership, median rwg = .80, ICC(1) = .25, ICC(2) = .67. Overall, these results met or exceeded the levels of reliability and agreement obtained in previous research (e.g., Farh et al., 2010). Thus, we aggregated the individual responses to the team level.

3.4. Analyses

Owing to the multilevel nature of the data, with teams nested within organizations, we conducted hierarchical linear modeling (HLM) analyses to test our hypotheses (Raudenbush, Bryk, Cheong, Congdon, & Toit, 2004). Given that the teams came from different organizations, we included an intercept-only model at the organization level in all analyses to control for any possible confounding effects of company-level factors on the relationships we tested. Thus, we had two-level models, with teams at Level 1 and organizations at Level 2.

To examine the indirect effect of cognitive diversity on team creativity via team intrinsic motivation, we used the “product of coefficient” approach (MacKinnon, Lockwood, & Williams, 2004). Specifically, we used the bootstrap sampling method (bootstrap sample size = 5000) to generate asymmetric confidence intervals (CIs) for the indirect effect. The bootstrapping CI approach can generate a more accurate estimation of the indirect effect compared with traditional methods such as Sobel’s (1982) test because it produces asymmetric CIs for the indirect effect using the respective distribution of the two regression coefficients that consist of the product term (MacKinnon et al., 2004). Finally, we followed Edwards and Lambert’s (2007) procedure to test the first-stage moderated mediation effect of transformational leadership.

4. Results

4.1. Descriptive statistics

Descriptive statistics, reliability estimates, and correlations for all measures are presented in Table 1. The reliabilities for all variables are acceptable (α > .70). A total of 54% of the teams worked on new products. The teams worked highly interdependently (mean = 5.27).

4.2. Tests of hypotheses

Table 2 summarizes the results for HLM analyses. Hypothesis 1 proposed that cognitive diversity would be positively related to team creativity. Consistent with H1, cognitive diversity was positively related to team creativity (γ = .30, p < .05), as shown in Model 4 in Table 2.

Hypothesis 2 predicted that cognitive diversity would be positively related to team intrinsic motivation. The result in Model 1 in Table 2 shows that cognitive diversity was positively associated with team intrinsic motivation (γ = .33, p < .05), supporting H2.

Hypothesis 3 stated that team intrinsic motivation would mediate the relation between cognitive diversity and team creativity. First, as shown above, cognitive diversity was significantly related to team intrinsic motivation. Second, when both team intrinsic motivation and cognitive diversity were included in the regression, only team intrinsic motivation was significant (γ = .34, p < .05; see Model 5 in Table 2), but cognitive diversity was not (γ = .19, n.s.), suggesting that team intrinsic motivation fully mediated the relation between cognitive diversity and team creativity. Furthermore, the bootstrapping test indicated that the indirect effect of cognitive diversity on team creativity via team intrinsic motivation was significant (99% confidence interval CI = [.07, .16], not containing zero). So H3 was supported.

Hypothesis 4 proposed that transformational leadership would moderate the relationship between cognitive diversity and team intrinsic motivation. Model 3 in Table 2 shows that team intrinsic motivation was significantly related to team creativity (γ = .42, p < .01). As shown in Fig. 2, simple slope results indicated that the relation between cognitive diversity and team intrinsic motivation is negative and significant when transformational leadership is low (γ = .31, p < .05), but positive and significant when transformational leadership is high (γ = .27, p < .05). Thus, H4 was supported.

Hypothesis 5 predicted a first-stage moderation effect, such that transformational leadership moderates the indirect effect of cognitive diversity on team creativity via team intrinsic motivation. We examined the first-stage moderation model using the procedure of Edwards and

<table>
<thead>
<tr>
<th>Table 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Means, Standard Deviations, Correlations, and Reliabilities.</td>
</tr>
<tr>
<td>Variables</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>1. Team size</td>
</tr>
<tr>
<td>2. Team tenure</td>
</tr>
<tr>
<td>3. Task interdependence</td>
</tr>
<tr>
<td>4. D1 (0 = others, 1 = basic research)</td>
</tr>
<tr>
<td>5. D2 (0 = others, 1 = applied research)</td>
</tr>
<tr>
<td>6. D3 (0 = others, 1 = new project)</td>
</tr>
<tr>
<td>7. Age diversity</td>
</tr>
<tr>
<td>8. Gender diversity</td>
</tr>
<tr>
<td>9. Organizational tenure diversity</td>
</tr>
<tr>
<td>10. Cognitive diversity</td>
</tr>
<tr>
<td>11. Transformational leadership</td>
</tr>
<tr>
<td>12. Team intrinsic motivation</td>
</tr>
<tr>
<td>13. Team creativity</td>
</tr>
</tbody>
</table>

Note: (N = 62 teams). Reliabilities are in parentheses. For all correlation above .25, p < .05; and above .33, p < .01.
Lambert (2007). The moderated path analytic procedures indicated that the path linking cognitive diversity and team intrinsic motivation, which is the first stage of the indirect effect of cognitive diversity on team creativity, significantly varied as a function of transformational leadership (i.e., the 99% confidence interval of the first-stage moderation effect was [.10, .19], not containing zero). As shown in Table 3 and Fig. 3, the results of the simple slope test indicated that the indirect effect of cognitive diversity on team creativity via team intrinsic motivation is positive and significant when transformational leadership is high ($\gamma = .09$, $p < .05$), but negative and significant when transformational leadership is low ($\gamma = -.10$, $p < .05$). These results support H5, except for the significant negative indirect effect of cognitive diversity when transformational leadership is low.

5. Discussion

5.1. Theoretical contributions

The present study contributes to the extant literature in several important ways. First, the diversity literature has mainly focused on readily-detected diversity attributes, such as tenure, age, educational, or functional diversity (Van Knippenberg & Schippers, 2007). A key assumption of these studies is that readily-detected diversity reflects cognitive diversity. However, several scholars have pointed out that the assumption may not always hold in reality (Kilduff et al., 2000; Lawrence, 1997), such that surface-level diversity may not always bring in complementary knowledge and perspectives to the team. Our study responds to Jackson et al.’s (2003) call for more research that directly measures deep-level diversity such as cognitive diversity (i.e., differences in thinking styles, knowledge, skills, values, and beliefs). Moreover, our findings suggest that Hoever et al. (2012) and Kurtzberg’s (2005) experimental results can be generalized to real working teams in organizational settings. Also, our replication for the effects of cognitive diversity on team creativity occurred in an international context, where the country’s prevailing social norms and expectations for fitting in were quite different from Hoever et al. (2012) and Kurtzberg’s (2005) investigation of the Western organizations.

Second, this study provides insights regarding the mechanism underlying the positive relationship between team cognitive diversity and team creativity. Drawing on cognitive evaluation theory (Deci & Ryan, 1980), we extended intrinsic motivation to the group level, and found that team intrinsic motivation mediated the relationship between team cognitive diversity and team creativity. Our results lend support to Amabile’s (1983, 1993, 1996) theory of creativity, which contends that intrinsic motivation is the major mechanism through which contextual factors influence creativity. Our findings are also important for developing and refining diversity and creativity theories about the
motivation mechanism through which cognitive diversity affects team creativity. In addition, by extending individual intrinsic motivation to the team level, our study echoes the argument of Chen and Kanfer (2006) that research on team motivation may be advanced by generalizing individual-level motivation theories to the team level.

Third, perhaps the most important finding of our study is that transformational leadership serves as a boundary condition for the effects of cognitive diversity on team intrinsic motivation and for the indirect effects of cognitive diversity on team creativity via team intrinsic motivation. Specifically, we observed that the intrinsic motivation of team members increases as teams become more cognitively diverse only when team leaders show high transformational leadership; team intrinsic motivation, in turn, results in higher levels of team creativity. More importantly, when transformational leadership is low, cognitive diversity is negatively related to team intrinsic motivation, and the indirect effect of cognitive diversity on team creativity via team intrinsic motivation is negative. One possible explanation for this finding is that in the absence of transformational leadership, team members may neither possess a shared understanding of collective goals nor place their self-interest ahead of the collective interest (Van Knippenberg et al., 2004). As a result, cognitive diversity may be perceived as a threat to individual ideas and ambitions. Moreover, without a leader’s intellectual stimulation and encouragement for innovation, team members may not realize the necessity of openly discussing different and opposing ideas with one another and may be less motivated to share their views on problems and issues at hand. In these situations, cognitive diversity may result in tension and conflicts among team members as well as cause members to view their daily job as less enjoyable and exciting (John, Northcraft, & Neale, 1999; Mohammed & Angell, 2004), thus reducing team creativity.

It is also noteworthy that team intrinsic motivation mediates the effect of cognitive diversity on team creativity in a non-linear manner. Although researchers agree on the mediating role of intrinsic motivation in the relationship between antecedents of creativity and creative outcomes (Amabile, 1996; Shalley et al., 2004), these mediation mechanisms seem to be more complicated. For example, Shin and Zhou (2003) found that individual intrinsic motivation partially mediates the relationship between transformational leadership and individual creativity. Shalley and Perry-Smith (2001) observed no significant mediation for intrinsic motivation in the relationship between expected evaluation and creativity. One possible explanation for these complex, non-linear results is that the mediation mechanism associated with intrinsic motivation may be affected by other factors (Amabile & Mueller, 2008). Our findings support this notion by demonstrating that cognitive diversity interacts with transformational leadership to influence the mediation effects of team intrinsic motivation on the relationship between cognitive diversity and team creativity.

### 5.2 Managerial implications

Our study offers several practical implications for organizations and team leaders. First, organizations may not always be able to build teams with diverse educational or functional backgrounds to take on creativity challenges, because it can be costly and even unrealistic in some circumstances. Nevertheless, to enhance team creativity, organizations should ensure that their teams are composed of team members with different cognitive attributes such as abilities, knowledge bases, beliefs, and values. These members can then bring in a broader repertoire of informational resources and expertise to ignite creative ideas through brainstorming and constructive conflict (Sutton & Hargadon, 1996).

In addition, team leaders should be aware of the importance of leadership behaviors in motivating cognitively diverse team members to be creative. Team leaders should display a set of transformational leadership behaviors to realize the potential of cognitive diversity. Specifically, they need to articulate a shared group vision, communicate high expectations in terms of creativity to followers, stimulate followers to attempt innovative ideas, and provide necessary coaching and mentoring to help followers develop creativity-relevant skills. Such leadership behaviors can serve as catalysts to help transform the cognitive diversity of team members into higher team intrinsic motivation, which in turn contributes to higher team creativity. Managers should also be cautioned that without transformational leadership behaviors, cognitive diversity may dampen team intrinsic motivation by introducing tension and conflicts among members, which then diminishes team creativity.

### 5.3 Limitations and future research

This study has several limitations. First, we used a cross-sectional research design, which precludes any conclusions of causality. Future research should adopt a longitudinal or experimental design to detect the causal effects of cognitive diversity on creativity. Second, it should be noted that we did not examine actual diversity among members in any specific cognitive attributes. Instead, we measured team members’ perceived diversity in a variety of different attributes. Our approach is appropriate for our sample. This is because members in real working teams usually perceive diversity in more than one dimension, and diversity in different dimensions is more likely to provide different perspectives and divergent ideas than diversity in one dimension.
Shin et al., 2012; Van der Vegt & Janssen, 2003). However, it would be interesting for future study to compare which type of diversity (actual vs. perceived) has a stronger influence on team creativity.

Third, we relied on supervisor ratings rather than objective measures of team creativity. Although this is a common practice in creativity research (Zhou & Shelley, 2003), future research should employ objective creativity measures to ensure the robustness of the results. Fourth, we only focused on the motivational states of teams. We theorize that team intrinsic motivation may result in smoother and more productive team processes, but we did not measure any team process variables. Future studies should further investigate whether team intrinsic motivation has a positive effect on team processes, such as social integration (Harrison et al., 2002) or the elaboration of task-related information (Van Knippenberg et al., 2004). This line of inquiry will help us better understand the interplay between team motivational states and processes.

This study contributes to our knowledge of how and when cognitive diversity can be transmitted into team creativity. Our study also empirically validates team intrinsic motivation as a mechanism that accounts for the relationship between cognitive diversity and team creativity. In addition, this research emphasizes the importance of transformational leadership, which determines whether cognitive diversity has a positive or negative indirect effect on team creativity via team intrinsic motivation. We hope that this study will stimulate future endeavors to advance our understanding of the relationship among team diversity, team motivation, and team creativity.

References


