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Expertise Dissimilarity and Creativity:

The Contingent Roles of Tacit and Explicit Knowledge Sharing

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Abstract

In this study, we investigated whether team-level knowledge sharing moderates the effects of individual-level expertise dissimilarity on individual employees' creativity in research and development (R&D) project teams. Expertise dissimilarity—defined as the difference in expertise and knowledge between a focal team member and her fellow team members—was operationalized in terms of the research department to which each member belonged. In Study 1, multilevel analyses of data collected from 200 members of 40 R&D project teams in a telecommunications company revealed that a team member with expertise dissimilar to that of her teammates was more likely to exhibit creativity when the project team as a whole engaged in higher levels of tacit, rather than explicit, knowledge sharing. In contrast, a member whose expertise was similar to that of her teammates was more likely to exhibit creative behavior when the team engaged in higher levels of explicit, rather than tacit, knowledge sharing. These findings were largely replicated in Study 2 using data collected from 82 members of 25 project teams from another telecommunications company.

Keywords:

expertise dissimilarity, creativity, knowledge sharing, project team, multilevel analysis

One of the key competitive advantages of firms lies in their ability to innovate (Somech, 2006). Special task forces and project teams composed of knowledge workers spearhead innovation for firms. Scholars from various research areas such as team diversity (Jehn, Northcraft, & Neale, 1999), knowledge management (Massey, Montoya-Weiss, & O'Driscoll, 2002), creativity and innovation (Gilson, Mathieu, Shalley, & Ruddy, 2005), organizational communications (Katz & Te'eni, 2007), and decision making in small groups (Brodbeck, Kerschreiter, Mojzisch, & Schulz-Hardt, 2007; Lu, Yuan, & McLeod, 2012), have generally shared the assumptions that (1) an individual employee is more likely to generate novel and creative ideas if she is able to access diverse knowledge and information by interacting with team members with dissimilar expertise (Gibson & Gibbs, 2006; Hambrick, Cho, & Chen, 1996; Homan, Van Knippenberg, Van Kleef, & De Dreu, 2007; Jehn et al., 1999; Polzer, Milton, & Swann, 2002; Sosa, 2011); and (2) knowledge sharing is an important team process that allows diverse expertise to be "cross-fertilized" among team members for knowledge generation and creative work (e.g., Gong, Kim, Zhu, & Lee, 2013; Hargadon & Bechky, 2006; Nonaka, 1994; Paulus, 2008; Srivastava, Bartol, & Locke, 2006; Tiwana & McLean, 2005).

Despite the documented benefits of expertise dissimilarity in work teams, an employee may find it difficult to understand her teammates who possess markedly different background expertise and knowledge, which might prevent her from using the knowledge and expertise of dissimilar colleagues to generate novel ideas (Carlile, 2004; Dahlin, Weingart, & Hinds, 2005; Tortoriello, Reagans, & McEvily, 2012). Research has shown that knowledge sharing among team members with dissimilar knowledge and expertise may not necessarily motivate individuals to generate new ideas and perspectives (De Dreu, 2007; Homan et al., 2007; Majchrzak, More, & Faraj, 2012). Rather, it depends on whether the knowledge shared is elaborate enough for the recipient to fully understand and meaningfully interpret the sender's unfamiliar expertise (Boland, Tenkasi, & Te'eni, 1994; De Dreu 2007; Majchrzak et al., 2012). Yet recent research has also revealed that among workers with similar background knowledge, sharing codified rather than elaborated knowledge is a more effective way of stimulating creativity (Katz & Te'eni, 2007). In this case, sharing intensive experiences and over-elaborate knowledge may even be counterproductive (Katz & Te'eni, 2007), as it does little to enhance understanding, requires additional effort, and consumes extra cognitive resources (Glynn, 1996; Simonton, 1999).

For instance, when an organizational psychologist collaborates with a behavioral economist to study a particular form of human behavior, sharing ideas merely by passing each other many papers and documents (codified information) from their respective fields may not help the two professionals to generate creative ideas. The psychologist may have no prior knowledge of the logic underlying the mathematical equations that describe human behavior, and the economist may not understand the content of and rationale for the relevant psychological theories. Although mathematical equations are a type of codified and explicit knowledge to the mathematician, they are not self-explanatory and are thus tacit in nature to the psychologist. To aid the psychologist's understanding of how mathematical equations can be used to describe and predict human behavior, the behavioral economist should engage in detailed discussions with the psychologist to share elaborated experiences with the topic (Boland & Tenkasi, 1995; Majchrzak et al., 2012; Nonaka, 1994). This allows the psychologist to create new knowledge by extending her expertise and knowledge scope through an understanding of the economist's know-how. In contrast, when two behavioral economists collaborate on a project, many of their individual perspectives and insights can be exchanged in the form of documents and equations, as they possess similar background knowledge. This method of exchanging ideas is both a sufficient and efficient way for them to use each other's insights to create new ideas (Katz & Te'eni, 2007).

Elaborated knowledge and codified knowledge correspond to the two distinct types of knowledge identified by Nonaka (1994): tacit knowledge and explicit knowledge, respectively. Tacit knowledge is subjective knowledge that is difficult to formalize, articulate, and communicate to others, such as personal experiences, professional insights, and know-how in a specific area. In contrast, explicit knowledge refers to objective knowledge that can be articulated, codified, and expressed in formal and systematic language, such as in documents, reports, and models (Nonaka, Toyama, & Konno, 2000). In team settings, therefore, we can distinguish between two types of knowledge sharing. The process of tacit knowledge sharing involves team members' sharing their personal experiences and elaborating on their background knowledge and expertise, whereas the process of sharing explicit knowledge is characterized by team members' exchanging ideas and knowledge in codified forms. With this distinction in mind, we propose a contingency framework, according to which, tacit knowledge sharing has greater potential than explicit knowledge sharing to help a knowledge worker with expertise dissimilar to that of her teammates to generate creative solutions. We also predict, conversely, that explicit knowledge sharing within a team is more likely than tacit knowledge sharing to enhance the creativity of a knowledge worker with expertise similar to that of her team members. We contribute to the literature by showing that neither expertise dissimilarity/similarity nor the degree of knowledge sharing independently affects team members' creativity; instead, individual creativity is facilitated or compromised by the interaction between individual members' expertise dissimilarity/similarity and different types of knowledge sharing.

Theoretical Background

Expertise Dissimilarity, Creativity, and Knowledge Sharing

In this study, we treat expertise dissimilarity as an individual-level construct. We refer to individual-level expertise dissimilarity as the difference between a focal employee and her fellow team members in terms of background expertise and knowledge (cf. Van der Vegt, Van de Vliert, & Oosterhof, 2003). Unlike dissimilarity in demographic variables, such as age and status, the degree of expertise dissimilarity cannot be assessed along the continuum of one particular characteristic shared by the interacting team members. Rather, it indicates differences in kind or category between team members' expertise (Harrison & Klein, 2007). Therefore, the maximum expertise dissimilarity occurs when the expertise of a focal individual differs in kind from that of every other team member, and the minimum expertise dissimilarity occurs when the focal employee has the same expertise as every other team member. Although previous research has suggested that team-level expertise diversity has a positive effect on creativity (e.g., Williams & O'Reilly, 1998), it is not known how this individual-level expertise dissimilarity influences individual employees' creativity.

Creativity is generally defined as the production of novel and appropriate ideas by either an individual or a small working group (Amabile, 1983). Previous studies have focused on how personality traits (e.g., Barron & Harrington, 1981; Gong, Cheung, Wang, & Huang, 2012; Gough, 1979; Guilford, 1959; MacKinnon, 1975) and individual cognitive processes (e.g., Mumford, Baughman, Maher, Costanza, & Supinski, 1997; Vincent, Decker, & Mumford, 2002) facilitate creativity. Unlike these individual-level predictors of creativity, however, the expertise-dissimilarity construct examined in this study reflects an individual's expertise relative to that of other team members. This individual-level antecedent of creativity has received little attention in the literature and investigating the effects of expertise dissimilarity provides a more nuanced understanding of how having different background expertise might drive individuals to become creative in work groups.

To come up with novel and creative ideas, an individual must be able to link and make use of ideas and viewpoints from multiple sources to broaden her own scope of knowledge (Amabile, 1983, 1988; Shalley & Zhou, 2008). An individual can generate new ideas by interacting with dissimilar others, receiving and assimilating their varying perspectives and forms of expertise (Tiwana & McLean, 2005). However, if an employee's expertise differs too greatly from that of her teammates, she may find it difficult to understand the other members, let alone make use of their knowledge, expertise, and perspectives to enhance her own creativity (Carlile, 2004; Dahli et al., 2005; Tortoriello et al., 2012).

Hence, we propose that team-level knowledge sharing is a critical information-processing mechanism that facilitates individual creativity by increasing team members' mutual understanding and ability to gain insights from others to broaden their scope of knowledge (Gong et al., 2013; Tiwana & McLean, 2005; Williams & O'Reilly, 1998). Unlike studies on individual-level information exchange that focus on how engaging in the processing of diverse information enhances individuals' performance and creativity (e.g., Gong et al., 2012), we treat team-level knowledge sharing as a contextual variable that shapes how information and insights are exchanged and mutually understood among team members. Although individual employees are responsible for creating knowledge, they must do so by obtaining useful information and insights from others (e.g., Amabile, Conti, Coon, Lazenby, & Herron, 1996; Gong et al., 2013; Shalley, Gilson, & Blum, 2009; Woodman, Sawyer, & Griffin, 1993; Zhang & Bartol, 2010). A work team forms a critical context that determines what type of knowledge is shared among employees, and influences the creative behavior of individual employees. As previously mentioned, we focus in this paper on two types of knowledge-sharing process within teams: tacit knowledge sharing and explicit knowledge sharing. In the following section, we propose that tacit and explicit knowledge sharing within teams may foster or hinder individual creativity depending on whether individuals are interacting with dissimilar or similar others.

Hypotheses

Joint Effects of Expertise Dissimilarity and Knowledge Sharing on Creativity

Our key contention is that tacit and explicit knowledge sharing may increase or impair the quality of work and innovation depending on whether the benefits of a certain type of knowledge sharing outweigh its costs in terms of meeting team members' needs (Haas & Hansen, 2005, 2007). Tacit knowledge sharing, which demands intensive interactions between senders and receivers, enhances mutual understanding within teams, but it also consumes additional effort and cognitive resources as individuals process elaborate information and manage interpersonal relationships (Carlile, 2004; Haas & Hansen, 2007; Taylor & Greve, 2006). Explicit knowledge sharing has the advantage of saving effort and cognitive resources, but does little to foster an in-depth understanding of and insight into teammates' background knowledge (Haas & Hansen, 2005, 2007; Katz & Te'eni, 2007; Perry-Smith, 2006).

We suggest that individual knowledge workers with high and low levels of expertise dissimilarity within their respective teams may benefit differently from distinct types of team-level knowledge sharing, as reflected in their engagement in creative behavior. In the following sections, we present a conceptual map of the four situations in which individual members' creativity may be enhanced or inhibited by the interaction of two dimensions, namely high or low individual-level expertise dissimilarity and tacit versus explicit team-level knowledge sharing (see Figure 1). The four possible combinations are as follows: (1) high expertise dissimilarity and tacit knowledge sharing; (2) low expertise dissimilarity and tacit knowledge sharing; (3) high expertise dissimilarity and explicit knowledge sharing; and low expertise dissimilarity and EKS. In the following sections, we develop predictions for individual creativity in each set of circumstances.

Insert Figure 1 about here

High Expertise Dissimilarity and Tacit Knowledge Sharing

It can be difficult for individuals to understand the specific work-related experience, know-how, and technical expertise of those whose knowledge and expertise differ from their own (Tortoriello et al., 2012). To the individual, dissimilar knowledge and expertise are tacit in nature, and require detailed explanation (Carlile, 2004). As it is difficult to transfer such tacit knowledge in textual form between dissimilar members, mutual understanding relies on the in-depth sharing of experiences (Nonaka, 1994), intensive social interaction (Nonaka & Takeuchi, 1995), and engagement in “deep knowledge dialogues” (Boland & Tenkasi, 1995; Majchrzak et al., 2012). A team process that emphasizes tacit knowledge sharing among members with dissimilar expertise may help individual members to understand others’ knowledge backgrounds and grasp their worlds from the “inside” (Nonaka, 1994; Majchrzak et al., 2012). Although team members involved in tacit knowledge sharing spend extra effort and cognitive resources tapping into each other’s “thought worlds” (Edmondson & Nembhard, 2009; Nonaka, 1994; Tortoriello et al., 2012) and dealing with interpersonal interactions (Taylor & Greve, 2006), this type of knowledge sharing enables individuals to generate creative ideas by understanding and appropriating the knowledge shared by dissimilar others. The benefits may thus outweigh the costs. In a controlled experiment, for example, Katz and Te’eni (2007) found that contextualized communication (information sent to the receiver with a detailed explanation) was more effective than uncontextualized communication (information without a detailed explanation) in enabling dyads with different background knowledge to understand shared information and devise better solutions to particular tasks.

Low Expertise Dissimilarity and Tacit Knowledge Sharing

For interacting members with similar expertise, a high level of tacit knowledge sharing within a team may have a weak or even detrimental effect on individual creativity. As mentioned above, tacit knowledge sharing has the advantage of allowing team members to tap into each other's "thought worlds." Even when team members have a common base of knowledge and expertise, individual members may possess specific knowledge or information that is difficult to codify, thus in teams comprising similar members, tacit knowledge sharing may still help individual members create novel ideas by broadening the scope of their knowledge. We contend, however, that the cost of frequent tacit knowledge sharing among similar members may outweigh its positive effect on individuals' creativity. Specifically, a high level of tacit knowledge sharing incurs high costs in the form of effort and cognitive resources. Conveying in-depth knowledge through a deep dialogue requires significant effort (Carlile, 2004; Majchrzak et al., 2012), and because team members with little or no differences in background expertise and knowledge find it easier to understand each other (Tortoriello et al., 2012), sharing detailed information about their past experiences, context-specific knowledge, and know-how does not provide individual members with much additional knowledge and information with which to generate novel and useful ideas (Brodbeck et al., 2007; Stasser & Titus, 1985, 2003). In addition, when individuals with similar backgrounds share their contextualized knowledge by engaging in "deep dialogues," they may find more similarities than differences, creating a biased consensus rather than stimulating divergent views (e.g., Perry-Smith, 2006; Schulz-Hardt, Brodbeck, Mojzisch, Kerschreiter, & Frey, 2006; Stasser & Titus, 2003). As a result, tacit knowledge sharing among individuals with similar expertise may even be detrimental to creativity. Based on data collected from 182 sales teams in a management-consulting company, Haas and Hansen (2007) found that when the expertise of an external consultant resembled that of team members within a firm, the consultant's personalized advice (i.e., her tacit knowledge sharing) neither stimulated creativity nor improved the quality of the team's final proposal. Worse still, the team took more effort to accomplish the task under these conditions.

To clarify the above reasoning, consider two hypothetical teams within a telecommunications company: one heterogeneous and one homogeneous. The heterogeneous team consists of a sales representative, a wireless-communications engineer, and an accountant. Their purpose is to develop a new mobile-phone promotion package that can be put on the market within a month. The homogeneous team consists of three computer engineers from the company's information-technology department, and their purpose is to improve the financial-transaction process by optimizing the company's information system. To share tacit knowledge, the members of each team may either present their specialized background expertise and knowledge in greater detail to each other in regular formal meetings, or spend time chatting informally in the company's "idea café," which is designed to provide a comfortable environment in which employees can exchange ideas while drinking coffee. The company also has an online knowledge-management system for explicit knowledge sharing.

A high level of tacit knowledge sharing occurs when team members regularly exchange their personal expertise and background knowledge with each other in formal presentations or in the "idea café." In these circumstances, the sales representative of the heterogeneous team will have a better understanding of the constraints and flexibility of the wireless-communication system and the associated accounting procedure. Even though participating in such knowledge-exchange activities consumes more cognitive resources and demands more effort to manage relatively intensive interpersonal interactions, this method enables the sales representative to gather a large number of insights and perspectives from the dissimilar others on her team, which broadens her knowledge scope, allowing her to create new ideas for the design of the promotion package. In contrast, as the computer engineers in the homogeneous team already possess overlapping background knowledge, too-frequent formal presentations and prolonged conversations in the "idea cafe" may not help them to gain enough new perspectives and insights to compensate for the effort and cognitive resources invested in these activities that would otherwise be available for creative work. As aforementioned, these deep dialogues and experience sharing sessions among computer engineers may direct their attention to the similarity of their knowledge backgrounds, generating a biased consensus (Perry-Smith, 2006; Schulz-Hardt et al., 2006; Stasser & Titus, 2003) that can inhibit individual creativity.

The above discussion suggests that when a team engages collectively in high levels of tacit knowledge sharing, a knowledge worker whose expertise is dissimilar to that of her teammates is more likely to display creativity than one whose expertise is similar to that of others. The knowledge worker with dissimilar expertise benefits more from tacit knowledge sharing in terms of gaining more diverse information from others than the one with similar expertise to that of others. In teams with fewer tacit knowledge-sharing activities, both expertise-dissimilar and expertise-similar members cannot gain additional insights from other team members. Thus, among such teams, expertise dissimilarity may not be more advantageous than expertise similarity in facilitating individual creativity. Taken together, in teams with a high level of tacit knowledge sharing, a higher level of expertise dissimilarity prompts a higher level of creativity. Conversely, in teams with a low level of tacit knowledge sharing, a higher level of expertise dissimilarity is less likely to foster individual creativity.

> *Hypothesis 1.* Tacit knowledge sharing within a team moderates the relationship between individual knowledge workers' expertise dissimilarity and their creativity, such that when the level of tacit knowledge sharing is higher, the relationship between individual knowledge workers' expertise dissimilarity and their creativity is more positive.

High Expertise Dissimilarity and Explicit Knowledge Sharing

Explicit knowledge sharing may be less effective in facilitating mutual understanding among members with dissimilar expertise. It is possible for team members to exchange knowledge and expertise through written documents, but when a team member's expertise differs from that of her colleagues, knowledge shared explicitly in the form of documents, data, and formulae does not help the individual acquire the substantive contextual information or interpretive schemes essential to understanding dissimilar knowledge bases. To this member, the knowledge possessed by her dissimilar teammates is tacit in nature, and cannot be transferred merely through codification. As a result, she may find that the codified information is too difficult to comprehend, and thus simply ignore the data or stop reading the documents. In the worst-case scenario, she may spend considerable time and effort scrutinizing a large amount of unfamiliar information but ultimately fail to understand it because she lacks the necessary interpretive scheme. This not only costs extra effort and cognitive resources that cannot be recouped, but also causes cognitive distraction from the main task. In such a situation, the advantage of saving cognitive resources and effort in explicit knowledge sharing becomes a disadvantage for expertise-dissimilar members.

Supporting this logic, Katz and Te'eni (2007) showed that dyads whose parties hold different perspectives tend to display a low level of mutual understanding and poor performance in work when they communicate only through e-mails (i.e., via uncontextualized information). Similarly, Haas and Hansen (2005) pointed out that a lack of shared understanding among team members with dissimilar expertise renders explicit knowledge sharing ineffective within the team, as the members are too different to make effective use of each other's perspectives and insights to generate new ideas. In short, for team members with dissimilar expertise, a high level of explicit knowledge sharing is less likely to stimulate creativity because it cannot facilitate mutual understanding and may even cause distraction.

Low Expertise Dissimilarity and Explicit Knowledge Sharing

As previously discussed, scholars have generally assumed that an employee who interacts with colleagues with dissimilar backgrounds, perspectives, and expertise is more likely to generate new ideas and creative solutions (e.g., Gibson & Gibbs, 2006; Hambrick et al., 1996; Homan et al., 2007; Jehn et al., 1999; Polzer et al., 2002). Even among members with similar backgrounds, however, individuals may possess different perspectives and distinct versions of domain-specific knowledge. Research on "hidden profiles" has shown that even within homogeneous groups, sharing individual perspectives and information can substantially improve the quality of group decisions in general (Lu et al., 2012; Stasser & Titus, 2003) and stimulate creativity in particular (Stasser & Birchmeier, 2003). One way to broaden the horizons of members of a homogeneous team is to let the team pool all possible information held by individuals (Stasser & Birchmeier, 2003), which can be achieved effectively through exchanging codified information such as online knowledge sharing.

We argue that a high level of explicit knowledge sharing may be of particular benefit to individuals whose background expertise and knowledge are similar to those of other team members. Specifically, researchers have suggested that sharing explicit knowledge can save more effort and cognitive resources than sharing tacit knowledge (Haas & Hansen, 2005; 2007; Katz & Te'eni, 2007; Tortoriello et al., 2012). As members with homogenous backgrounds overlap in what they know, they are not only able to comprehend knowledge shared in codified forms within the team (Tortoriello et al., 2012), but also capable of assessing and selecting useful viewpoints and perspectives from a large pool of codified information (Carlile, 2004; Wegner, 1987). Explicit knowledge sharing does not require intensive social interaction, which allows members to obtain ideas, information, and knowledge from other members without the consensus bias, conflicts, and distraction that may result from intensive social interaction (Jehn et al., 1999; Majchrzk et al., 2012; Taylor

& Greve, 2006). Hence, for interacting members with similar knowledge and expertise, the advantages of explicit knowledge sharing in enhancing creativity are likely to override the disadvantages of its lack of personalized elaboration.

Returning to our hypothetical example, a high level of explicit knowledge sharing occurs when the members of both teams upload a large amount of task-related information to the company's online knowledge-management system. This does not benefit the sales representative on the heterogeneous team because she does not understand the technical terms used for the wireless-communication system, or the associated accounting jargon. She may not even wish to scan the information on the company's knowledge-management system because it is incomprehensible to her. Therefore, these explicit knowledge sharing practices do not help the sales representative gain new perspectives from the other two members of her team. However, if the three computer engineers on the homogeneous team upload all of their work-related documents, solutions to potential problems, and computer-program scripts to the company's knowledge-management system, every member will have sufficient background knowledge to quickly search for and select relevant information and new insights using the online system. In this way, the computer engineers do not need to put too much effort into managing interpersonal interactions and can simply focus their effort and cognitive resources on gaining new ideas from the online system to broaden their scope of knowledge, thereby developing creative ways of optimizing the company's information system. They can also diagnose the information objectively without being influenced by the consensus bias caused by social interactions with other members who have similar knowledge backgrounds.

The above discussion suggests that when a team engages collectively in high levels of explicit knowledge sharing, a knowledge worker whose expertise is dissimilar to that of her teammates is less likely to display creativity than one whose expertise is similar to that of others. The knowledge worker with similar expertise can more effectively broaden her own scope of knowledge by gaining codified knowledge from others than the worker whose expertise is dissimilar to that of her coworkers. In contrast, when a team rarely engages in explicit knowledge sharing, neither its expertise-similar nor its expertise-dissimilar members benefit from working with each other in terms of broadening their own expertise to generate new knowledge. In such situations, a member whose expertise is similar to that of others does not necessarily exhibit more creativity than one whose expertise is dissimilar. Taken together, in teams with a high level of explicit knowledge sharing, a lower level of expertise dissimilarity (i.e. higher similarity) prompts a higher level of creativity. Conversely, in teams with a low level of explicit knowledge sharing, a lower level of expertise dissimilarity is less likely to lead to higher creativity.

> *Hypothesis 2.* Explicit knowledge sharing within a team moderates the relationship between individual knowledge workers' expertise dissimilarity and their creativity, such that when the level of explicit knowledge sharing is higher, the relationship between individual knowledge workers' expertise dissimilarity and their creativity is more negative.

Study 1: Methodology

Sample

We collected our data from one of the largest telecommunication companies in China. The firm is currently publicly listed on both the Hong Kong and New York stock exchanges. By the end of 2007, it had hired almost 244,867 employees, developed a subscriber base of 210 million, achieved an annual revenue of almost $28 billion, and been recognized by *Fortune Magazine* as one of the world's top 500 firms for seven consecutive years. The company has three R&D centers in three major Chinese cities—Beijing, Shanghai, and Guangzhou. The centers' main tasks include developing new telecommunications technologies and network systems (e.g., new technologies and systems to support 3G mobile-phone networks and Internet services), upgrading existing fixed-line and mobile-telecommunications systems, developing and promoting new products and services, and gathering and analyzing market-related information.

Within each research center there are between 15 and 20 research departments, each of which addresses a specific research area and employs researchers with relevant background knowledge and expertise. In the data-transmission department, for example, most of the employees have an engineering degree in electronic communication. In total, the three research centers house 44 specialized departments. The firm's managers select people from various departments to build project teams that are assembled as task forces for R&D projects and are thus designed for different purposes. The criterion for recruiting team members is that their expertise matches the needs of the relevant project.

The data were drawn from an internal company survey of randomly sampled project teams across the three centers. Two sets of questionnaires were developed: one for the team members and the other for their project supervisors. The researchers personally visited each of the selected team members and supervisors to explain the survey's purpose and procedure. We emphasized that their responses would be kept confidential and that the results would only be reported in aggregate form. The team members received a questionnaire on their expertise and their tacit/explicit knowledge sharing activities, accompanied by an introductory letter and a return envelope. Their project supervisors were asked to complete a separate questionnaire containing questions about the creativity of individual team members. To ensure confidentiality and avoid eliciting socially desirable answers, no other employees from the target firm were present during the survey. The respondents were instructed to seal their completed questionnaires in the envelopes and return them directly to the researchers onsite. We invited all of the project team members to fill out the questionnaires. We received completed questionnaires from 200 respondents across 40 teams, yielding an overall response rate of 81%. The response rate ranged from 38% to 100% between teams. Thirty of the 40 teams had a 100% response rate, and only one team had a response rate lower than 50%. The teams' sizes varied from 4 to 15 people (mean = 5.0, s.d. = 1.5). The mean age was 30.5 years (s.d. = 4.3), the mean tenure was 4.2 years (s.d. = 3.4), and 36% of the respondents were female.

Measures

Expertise dissimilarity. In the subordinates' questionnaire, we asked the respondents to indicate the departments to which they were formally attached. The respondents were drawn from the 44 different departments (wireless communications, data transmission, network switching, system integration, etc.) comprising the three research centers, with no more than 9.5% of the respondents coming from a single department. As each department specializes in a specific area, the employees within a particular department consistently perform tasks related to the target area. This is essentially a learning process during which employees accumulate experience, ensuring that they gain an increasingly in-depth understanding of the specialized task area (Fichman & Kemerer, 1997). We thus used each respondent's department as a proxy for his/her expertise.

To calculate the individual-level scores for expertise dissimilarity, we used the procedure suggested by Tsui, Egan, and O'Reilly (1992) and applied by others (e.g., Van der Vegt et al., 2003). We first coded the expertise dissimilarity between one focal employee and every other team member in each team, with 1 indicating dissimilarity (i.e., from a different department) and 0 indicating similarity (i.e., from the same department). Next, we computed the square root of the sum of the dissimilarities between the focal member and every other member of the team, divided by the total number of respondents on the team. A higher value connoted a greater dissimilarity in expertise between the focal member and the rest of the team. The dissimilarity scores ranged from 0 to .94.

Knowledge sharing. The items for knowledge sharing were drawn from previous research (Bock, Zmud, Kim, & Lee, 2005) and adapted to suit the context of our investigation. Whereas Bock et al. (2005) measured individuals' *intention* to share knowledge, we asked our respondents to describe their existing knowledge-sharing behavior. However, we did not ask the respondents to describe the ways in which other members of the team shared their knowledge for three reasons. First, it is generally difficult for the individual members of a team to determine the extent to which explicit knowledge is shared by other team members, especially when the knowledge is shared privately by individuals rather than in a publicly centralized pool. Second, it is even more difficult for individuals to reliably assess the extent to which other members share their personal experience, know-how, and specialized skills with the team. Rather, it is the individual members themselves who have this information and are able to reflect on whether they have shared their tacit knowledge with other team members. Indeed, for hard-to-observe behavior such as knowledge sharing, the focal individual's cognitive framework is usually the most appropriate frame of reference for her own behavior (Dutton & Penner, 1993; Weick, Sutcliffe, & Obstfeld, 2005). Third, following this reasoning, some recent studies have used aggregated self-rated measures to represent team-level helping behavior (Dimotakis, Davison, & Hollenbeck, 2012), cooperation, and trust (Fisher, Bell, Dierdorff, & Belohlav, 2012). Also, studies on organizational citizenship behavior (OCB) and counterproductive behavior (CWB) have shown that self-rated measures of OCB and CWB may more accurately reflect these forms of behavior than ratings provided by others (Dalal, 2005; Spector, Bauer, & Fox, 2010), simply because the "individual employee is in the best position to know about all the CWB and OCB he or she has performed" (Spector et al., 2010, p. 782). For the above reasons, tacit knowledge sharing (TKS) was measured in the current study using three self-report items: "I share my experience or know-how from work with members in this team frequently," "I always provide my know-where or know-whom at the request of other team members," and "I share my expertise from my education or training with other team members" (Bock et al., 2005). Explicit knowledge sharing (EKS) was measured using two items: "I share my work reports and official documents with members in this team frequently," and "I provide my manuals, methodologies and models for members of this team." The above two constructs were both measured on a seven-point Likert-type scale, with anchors ranging from strongly disagree (1) to strongly agree (7). The Cronbach's alpha coefficients for TKS and EKS were .71 and .95, respectively.

Creativity. The measure of creativity was adapted from Zhou and George's (2001) study. The supervisor of each R&D project team assessed every team member's creativity based on 13 items. Sample items include "This team member comes up with new and practical ideas to improve performance" and "This team member comes up with creative solutions to problems." The Cronbach's alpha coefficient for this measure was .77.

Control Variables

To rule out alternative explanations, we controlled for the effects of a number of variables. We first controlled for team members' age, gender, and organizational tenure (Van der Vegt et al., 2003). To minimize the effect, if any, of evaluative bias among supervisors, we also included a dichotomous variable to determine whether each team member and his/her supervisor shared the same expertise (i.e., came from the same department). We also controlled for the sizes of the R&D project teams, based on company records. As the firm's three research centers are located in three different major cities in China, we used two dummy variables to represent the research centers with which specific respondents were associated.

Results

Measurement Model Evaluation

Table 1 shows the descriptive statistics, correlations, and reliabilities of all of the key variables. In terms of internal consistency, the Cronbach's alpha values were all greater than the recommended .70 (Nunnally, 1978). To evaluate the measurement model, we first performed a confirmatory factor analysis (CFA) using AMOS 7.0 to statistically differentiate the three key constructs; that is, TKS, EKS, and creativity. The results indicated an acceptable fit. Specifically, the χ^2 to degree of freedom (DF) ratio of 2.89 was smaller than the 3.0 recommended by Hair, Anderson, Tatham, and Black (1998). The Tucker-Lewis index (TLI, .92) was higher than .90 (Teo, Wei, & Benbasat, 2003), the comparative fit index (CFI, .95) was higher than .90 (Gefen, Karahanna, & Straub, 2003), the standardized root mean square residual (SRMR, .04) was lower than .08 (Hu & Bentler, 1999), and the root mean square error of approximation (RMSEA, .08) was lower than .10 (Browne & Cudeck, 1994).

Insert Table 1 about here

Aggregation at the Team Level

We examined whether individual respondents' scores on the TKS and EKS scales could be aggregated at the team level. We calculated the ICC(1) and ICC(2) for each construct (James, 1982) and, respectively, found values of .11 and .42 for TKS and .10 and .38 for EKS. The ICC(1) values were close to the median value of .12 in the organizational literature and thus represented a moderate ICC(1) value (Bliese, 2000; Bliese & Hanges, 2004). The ICC(2) values were relatively low, but comparable to the median or recommended ICC(2) values for group-level constructs reported in the literature (Liao & Rupp, 2005; Polzer et al., 2002;

Richter, West, Van Dick, & Dawson, 2006; Schneider, White, & Paul, 1998). These results suggest that the aggregation of these two variables at team level was justified.

Hypothesis Testing

To test our hypotheses, we performed multilevel analyses using MLwiN, a mixed-effects model software package (Goldstein et al., 1998). Table 2 presents the results of the multilevel analyses, with an improvement in model-fit statistic at each step. First, we obtained an ICC(1) of .06 for creativity in an unconditional model, indicating sufficient group-level variation in creativity. In Step 1, we entered all of the individual- and team-level control variables. In Step 2, we added the dissimilarity scores to the model. Expertise dissimilarity was not found to be significantly related to creativity. In Step 3, we performed the random-slope test to determine whether the links between expertise dissimilarity and creativity varied significantly across teams. The results revealed a significant increase in model fit (χ^2 = 3.87, *df* = 1, $p < .05$), suggesting a noteworthy variation in the slopes across the 40 teams. In Step 4, we added a quadratic term of expertise dissimilarity to gauge the potential inverted U-shaped relationship between dissimilarity and creativity.[1] The quadratic term was not significant.

Insert Table 2 about here

In Step 5, we added team-level TKS and EKS, and examined their direct influence on the dependent variable. We found that neither TKS nor EKS had a direct effect on creativity. In Step 6, we tested the cross-level moderating effects of TKS and EKS on the relationship between expertise dissimilarity and creativity. We also included the interaction terms of TKS and EKS to examine the two-way interaction effects more holistically. First, there was no

[1] The Dahlin et al. (2005) study revealed an inverted U-shaped relationship between educational diversity and knowledge use at the team level. Their key argument was that the beneficial effect of diversity on the range and depth of information use, “like many good things, is good only in moderation” (Dahlin et al., 2005, p. 1111). Although Dahlin et al. conducted the analyses at the team level and our research focuses on individual-level expertise dissimilarity, we suspected that a similar inverted U-shaped relationship between expertise dissimilarity and creativity may exist at the individual level. We included the quadratic term but it did not exert any significant influence.

significant interaction effect between TKS and EKS. In addition, we found a significant positive interactive effect of TKS and expertise dissimilarity on creativity (*B* = .26; *p* < .01). However, we found a significant negative interactive effect of EKS and expertise dissimilarity on creativity (*B* = -.26; *p* < .01).

The plots of the interactive effects are shown in Figures 2A and 2B. To gain a more nuanced understanding of these effects, we tested the simple slopes for the link between expertise dissimilarity and creativity. In teams with a high level of TKS, expertise dissimilarity was positively associated with creativity (*B* = .24, *p* < .01). In teams with a low level of TKS, expertise dissimilarity was negatively associated with creativity (*B* = -.28, *p* < .01). Hypothesis 1 was thus partially supported, because we had not expected to find a significant negative link between expertise dissimilarity and creativity when TKS is low. Moreover, expertise dissimilarity was negatively associated with individual creativity in teams with a high level of EKS (*B* = -.28, *p* < .01), whereas expertise dissimilarity was positively related to creativity in teams with a low level of EKS (*B* = .29, *p* < .01). Therefore, Hypothesis 2 was also partially supported because we had not expected a significant positive link to exist between expertise dissimilarity and creativity when EKS is low.

Insert Figure 2 about here

Study 2

The purpose of Study 2 was to replicate the findings of Study 1 in another setting, increasing the generalizability of our findings. We also wanted to control for the effects of a few additional team-level variables such as team identification, team psychological safety, and team climate for innovation, which scholars have shown to have significant effects on creativity and knowledge sharing in work groups (Edmondson, 1999; Van der Vegt et al., 2003; Yuan & Woodman, 2010).

Method

Sample. The data for Study 2 were collected from two research units at another telecommunications firm in China. This firm is one of the largest mobile phone service providers in China and, like the previous firm, is listed on the Hong Kong and New York stock exchanges. At the end of 2007, the company had almost 130,000 employees and had achieved a subscriber base of 369.3 million. With annual revenue of almost $40 billion in 2007, it is recognized as a Global 500 firm by the *Financial Times* and is one of the largest telecommunications service providers in the world. The two units from which the data for this study were drawn comprise 34 specialized departments from which employees were selected to form teams for required projects.

As in Study 1, the data were drawn from two sets of questionnaires targeting team members and their project supervisors independently. Eighty-two individuals belonging to 25 teams provided usable responses. The teams' response rates ranged from 57% to 100%. Nineteen of the 25 teams had a 100% response rate, and only two teams had a response rate lower than 60%. The teams' sizes varied from three to eight individuals (mean = 4.42, s.d. = 1.56). The mean age of the respondents was 31 years (s.d. = 4.9), the mean organizational tenure was 6.2 years (s.d. = 6.1), and 86.6% of the respondents were male.

Measures. TKS and EKS were measured using the same items as in Study 1. The Cronbach's alpha values were .85 for TKS and .84 for EKS. We measured expertise dissimilarity using the same indicator as in Study 1. In the members' questionnaire, we asked each respondent to write down the name of the department to which he/she formally belongs. The respondents were drawn from 15 of the 34 departments (power supply, wireless, construction, etc.) with no more than 19.5% of the respondents coming from a single department.

Similar to Study 1, we obtained an ICC(1) value of .11 for creativity in an unconditional model, suggesting that there was sufficient group-level variation in creativity. We controlled for the effects of the following variables: team members' age, gender, organizational tenure, and educational level; the similarity of team members' expertise to that of their supervisors; and team size. Some team-level variables (team identification, team psychological safety, and team climate for innovation) were also included to rule out other possible explanations. Specifically, team identification was measured using a four-item, five-point scale adapted from Van der Vegt et al. (2003). A sample item is "I strongly identify with the other members of my work team." Team psychological safety was measured using a seven-item, seven-point scale adapted from Edmondson (1999). A sample item is "It is safe to take a risk on this team." Finally, team climate for innovation was measured using a 13-item, 5-point scale adapted from Yuan and Woodman (2010). A sample item is "Around here, people are allowed to try to solve the same problems in different ways." Table 3 shows the descriptive statistics, correlations, and reliabilities for these measures.

Insert Table 3 about here

Aggregation at the team level. We calculated the ICC(1) and ICC(2) values for the two knowledge-sharing factors, respectively, and obtained values of .22 and .48 for TKS and .18 and .41 for EKS.

Multilevel analysis. As in Study 1, we tested the mixed-effect model using MLwiN. In Step 1, we entered all of the individual- and team-level control variables: team members' age, gender, organizational tenure, and education level; the expertise similarity between team members and their supervisors; team size; research center (dummy); and members' ratings of team identification, team climate for innovation, and team psychological safety. In Step 2, we added the expertise-dissimilarity variable to the model, but observed no direct effect on the dependent variable. In Step 3, we aimed to determine whether the link between expertise dissimilarity and creativity varied significantly across the teams. The results revealed a significant increase in model fit (χ^2 = 11.77, df = 1, p < .05), indicating a salient variation in the slopes across the 25 teams. In Step 4, we added the quadratic term, which was not found to be significant. In Step 5, we added the two team-level knowledge-sharing variables (TKS and EKS) to the model, but found no direct effect on creativity. In Step 6, we tested the cross-level moderating effects of TKS and EKS on the relationship between expertise dissimilarity and creativity. The results showed exactly the same pattern as in the main study; that is, TKS and expertise dissimilarity had a significant positive interactive effect (B = .22; p < .05) and EKS and expertise dissimilarity had a significant negative interactive effect (B = -.36; p < .01) on creativity.

We further tested the simple slopes of the link between expertise dissimilarity and creativity, and obtained results similar to those in Study 1: (a) in teams with a high level of TKS, expertise dissimilarity was positively associated with creativity (B = .48, p < .01); (b) in teams with a high level of EKS, the relationship between expertise dissimilarity and creativity was marginally negative (B = -.21, p = .074 < .10); and (c) in teams with a low level of EKS, the relationship between expertise dissimilarity and creativity was positive (B = .62, p < .01). Finally, we noted a negative association between expertise dissimilarity and creativity in teams with a low level of TKS—a result similar to that obtained in Study 1. However, this association was not significant (B = -.07, p = .33) in Study 2. Overall, despite the use of a much smaller sample, Study 2 successfully replicated most of the results of Study 1, indicating the robustness of our findings.

Insert Table 4 about here

Discussion

The findings of our two studies challenge two basic assumptions in the literature on creativity. First, it has been assumed that an individual employee who interacts with others with dissimilar expertise and knowledge backgrounds is more likely to generate novel and creative ideas (e.g., Gibson & Gibbs, 2006; Homan et al., 2007; Hambrick et al., 1996; Jehn et al. 1999; Polzer et al., 2002; Sosa, 2011). However, our findings suggest that a knowledge worker whose expertise is dissimilar to that of her teammates does not necessarily become creative. Rather, both expertise dissimilarity and similarity can drive individual knowledge workers to exhibit creativity, depending on the knowledge-sharing practices carried out by the team to which they belong. In particular, a knowledge worker with expertise dissimilar to that of her teammates is more likely to show creativity when the team's information processing is characterized by a high level of tacit knowledge sharing among members. In contrast, a knowledge worker with expertise similar to that of her teammates is more likely to exhibit creative behavior when the team's information processing is characterized by a high level of explicit knowledge sharing.

Second, in contrast to the general assumption that knowledge sharing is conducive to creativity (Argote, McEvily, & Reagans, 2003; Cummings, 2004; Dyer & Nobeoka, 2000; Gong et al., 2013), we argued and showed that knowledge sharing may not always benefit—and can even hamper—individual creativity. Specifically, in Studies 1 and 2, neither tacit nor explicit knowledge sharing at the team level was found to directly affect individual creativity (Tables 2 and 4). The results of Study 1 also indicated that a high level of explicit knowledge sharing among members with dissimilar expertise can be counter-productive (Figure 2B). This finding was marginally supported by Study 2, which used a relatively small sample. These results support our reasoning that a high level of explicit knowledge sharing not only requires expertise-dissimilar team members to consume extra cognitive resources and effort in studying unfamiliar material, but may also ultimately fail to help them understand and leverage the knowledge and expertise of dissimilar team members. In addition, the results of both studies show that a high level of tacit knowledge sharing within a team may also hinder an individual member's creativity when she interacts with members whose background expertise and knowledge are similar to hers (Figure 2A). Members with similar expertise tend to be more familiar with each other's specialties, perspectives, and backgrounds. In these circumstances, tacit knowledge sharing enables team members to gain only a limited number of additional insights, while consuming additional effort and cognitive resources that could be allocated more productively elsewhere (Carlile, 2004; Haas & Hansen, 2007; Taylor & Greve, 2006). Also, intensive exchanges of past experiences and background knowledge among expertise-similar members can result in a consensus bias that inhibits creativity (Perry-Smith, 2006; Schulz-Hardt et al., 2006; Stasser & Titus, 2003). In the abovementioned cases, the cognitive resources and effort spent on sharing knowledge may not be outweighed by the benefits of obtaining additional perspectives and information for knowledge creation.

Interestingly, sharing less knowledge can enhance creativity under certain conditions. For example, the results of both studies showed that in a team with a low level of explicit knowledge sharing, members are more creative when interacting with dissimilar, rather than similar, colleagues (Figure 2B). There are two possible explanations for this. First, when a team member works with colleagues whose expertise is similar to her own, she may still need to exchange basic ideas and information to capitalize on the others' perspectives. With only a basic, low-level exchange of ideas in codified form, team members with similar expertise are less likely to find unique information and ideas that help them broaden their own views (e.g., Hargadon & Bechky, 2006). A low level of explicit knowledge sharing among team members with similar background knowledge may also suggest that the members' working relationships are poor, which may in turn reduce individuals' motivation to engage in creative behavior. Second, as individuals cannot learn much from dissimilar team members through explicit knowledge sharing, a low level of explicit knowledge sharing does not hinder creative work and may even support creativity by preventing team members from being exposed to documents, manuals, and reports that are difficult to understand and process.

Furthermore, the findings of Study 1 suggest that when a team engages in low levels of tacit knowledge sharing, individual members may actually be more creative when their teammates have similar, rather than dissimilar, expertise (Figure 2A). Although a lack of tacit knowledge sharing prevents members with dissimilar expertise from tapping into each other's knowledge, it increases the creativity of members with similar expertise by (1) minimizing their expenditure of effort and cognitive resources; (2) reducing the likelihood of unnecessary conflict resulting from the intensive social interaction involved in tacit knowledge sharing (Smith, 2003); and (3) leaving them with more energy and room for creativity (Haas & Hansen, 2005, 2007; Ohly, Sonnentag, & Pluntke, 2006; Paulus, Nakui, Putman & Brown, 2006; Taylor & Greve, 2006; Majchrzak et al., 2012). However, we were unable to fully replicate this finding in Study 2, perhaps due to the small sample size (82 individuals from 25 teams). We would advise future researchers to attempt to replicate our findings using a larger sample.

To summarize, it is uncertain whether more expertise dissimilarity is more valuable than less dissimilarity, or whether one type of knowledge sharing is more important than another for stimulating individual knowledge workers' creativity in project teams. Rather, there is an underlying contingent relationship between the level of expertise dissimilarity and the type of knowledge shared or processed within teams. With an appropriate combination of expertise dissimilarity and knowledge sharing, sharing explicit knowledge is more conducive to fostering individual creativity than sharing tacit knowledge, and the creativity generated from interactions among team members with similar expertise may even exceed that of individuals interacting with others who have dissimilar background knowledge.

Implications for Creativity

By adopting a cross-level interactionist approach to studying employee creativity (e.g., Hirst, Van Knippenberg, & Zhou, 2009), we have demonstrated that group-level knowledge sharing activities and individual group members' expertise dissimilarity jointly predict individual creativity. These findings extend the creativity research in two important ways. First, some researchers have maintained that creative ideas and new knowledge are formed in the minds of individuals (Boland et al., 1994; Oldham & Cummings, 1996; Taggar, 2002), and that being unique from other members drives individuals to break away from taken-for-granted norms to generate novel ideas (Janssen & Huang, 2008). In this paper, we unveiled a more complex yet insightful picture of how individuals can leverage their uniqueness or dissimilarity in work groups to become creative by examining the effect of individuals' expertise dissimilarity, a construct that has not been systematically investigated in the creativity literature. Unlike the existing individual-level predictors of creativity addressed in the earlier literature (e.g., Gong et al., 2012; Gong et al., 2013), the expertise dissimilarity construct examined here reflects an individual's expertise relative to that of other team members. Our findings suggest that an individual with unique expertise may not be able to understand and use the expertise of others unless the team members collectively engage in tacit knowledge sharing to allow her to tap into the knowledge backgrounds of dissimilar others. Our study offers a more nuanced understanding of why and when diversity in work teams drives creativity.

Second, the majority of empirical studies and theoretical works on individual creativity have focused on the benefits of diversity in work groups (Gibson & Gibbs, 2006; Hambrick et al., 1996; Homan et al., 2007; Jehn et al. 1999; Polzer et al., 2002). Yet, in the real world, teams composed of experts with homogeneous knowledge backgrounds are often given the task of developing creative solutions to problems within a specific knowledge domain. Our findings suggest that team-level explicit knowledge sharing activities can facilitate creativity among members of homogeneous teams because explicit knowledge sharing is particularly effective in helping homogeneous team members exchange a great amount of information that broadens their perspectives at a relatively low cost of cognitive resources and effort.

Implications for Research on Knowledge Sharing

Although scholars have traditionally held that knowledge sharing always leads to positive outcomes, some have recently challenged this view, contending that knowledge sharing comes with both benefits and costs, and that its results can be positive or negative (Haas & Hansen, 2005, 2007; Majchrzak et al., 2012). Consistent with these emerging views, our findings suggest that knowledge sharing can bring about both positive and negative consequences and reveal the differential effects between sharing tacit and explicit knowledge. Compared to explicit knowledge, tacit knowledge takes more effort to share, requires more cognitive resources to transfer, and is more difficult for others to duplicate (Hansen, 1999; Markus, 2001). Due to its high cost and scarcity, researchers tend to assume that tacit knowledge has a higher value than explicit knowledge (Markus, 2001). Our findings, however, suggest that it is inappropriate to underestimate the value or significance of explicit knowledge sharing. Instead, we have pushed the envelope of knowledge in this area by theoretically formulating and empirically verifying the proposition that both tacit and explicit knowledge sharing may have positive and negative effects on creativity that are contingent on the expertise dissimilarity of the interacting team members.

Limitations and Future Research

Despite its contributions to theory and practice, this study has limitations that present opportunities for future research. First, both studies were conducted in the telecommunications service industry in China. Therefore, caution should be exercised when generalizing our findings to other industrial and cultural settings. Second, although the research design reduced common-source bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003), we are still unable to draw firm conclusions about causality from a cross-sectional study. A longitudinal design measuring the independent and dependent variables with time lag would be necessary to confirm the causal relationships inferred from this study. Third, we used functional department to represent team members' expertise. Although, as argued earlier, this measure is better able to capture the work-related expertise of the team members than their educational backgrounds, functional department remains a weak proxy for expertise because it cannot fully capture the knowledge accumulated over time. Future research should consider incorporating the tenure of team members serving in a particular functional department to better reflect this construct.

Fourth, we measured team-level knowledge sharing by asking individual employees to describe the extent to which they share tacit/explicit knowledge with their teammates. A more effective way to capture knowledge-sharing activities in work groups would be via social networks, or using a round-robin design (Warner, Kenny, & Stoto, 1979). For example, the round-robin approach would involve every team member rating his/her experience of sharing knowledge with every other member of the team. The resulting insights into dyadic knowledge-sharing behavior could then be aggregated at the team level (cf. Lam, Van der Vegt, Walter, & Huang, 2011). Using social networks or taking a round-robin approach would not only allow researchers to measure knowledge-sharing practices in teams more accurately, but would also offer a more nuanced understanding of the interactions between different dyads within a team (Lam et al., 2011).

Fifth, we conceptualized knowledge sharing as a critical team-level process that facilitates individuals in understanding others' ideas. However, previous research has suggested that people are more likely to engage in information sharing when they interact with dissimilar individuals, because they expect to obtain more new information from dissimilar, than from similar, others (Thomas-Hunt, Ogden, & Neale, 2003). Such information-sharing activities may help to enhance individuals' creativity (Gong et al., 2012; Gong et al., 2013). We thus performed additional analyses to examine the potential mediating role of tacit/explicit knowledge sharing in the link between expertise dissimilarity and creativity. However, we found no evidence of the mediating effects of knowledge sharing in either study. A possible explanation for the divergence of our results from those of previous studies is that Thomas-Hunt et al. (2003) operationalized dissimilarity in terms of social connection versus social isolation, whereas we focused on knowledge-based expertise dissimilarity. It is possible that compared to differences in social connection/isolation, diverse knowledge bases are more likely to deter some, if not all, team members from engaging in knowledge-sharing activities. In R&D teams, expertise dissimilarity may not affect the extent to which one individual shares knowledge with another. Rather, the team's knowledge-sharing norms or climate may matter more. We would advise future researchers to explore the reasons why and when expertise-dissimilar individuals decide to overcome expertise barriers to share knowledge with others.

Implication for Practitioners

Although we have focused on individual-level expertise dissimilarity and creativity, the findings of this study offer managers insight into the complexity of knowledge management in teams. To form successful project teams, managers should first challenge the general belief that "diversity is good," and recognize that interactions between both dissimilar and similar members can generate new and useful ideas. What is more, interactions between expertise-dissimilar team members do not necessarily enhance individuals' creativity any more than do interactions between those with similar expertise. In teams, successful knowledge assimilation and creation rely on managers' in-depth understanding of the intricacies of effective knowledge sharing. In particular, managers should acknowledge (1) that there are distinct types of knowledge sharing; (2) that the benefits of knowledge sharing always accompany the associated costs; and (3) that the costs and benefits of sharing tacit and explicit knowledge are quite different for members who interact with expertise-dissimilar colleagues and for those who share expertise with their teammates. These insights may enable managers to devise more appropriate and specific knowledge-sharing methods to maximize the cross-fertilization of knowledge within teams.

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Table 1

Descriptive Statistics, Correlations, and Reliability – Study 1

Variables	Mean	S.d.	1	2	3	4
1. Expertise dissimilarity	.41	.36				
2. Creativity	3.85	.68	.09			
3. Tacit knowledge sharing[a]	5.63	.86	- .21*	.01		
4. Explicit knowledge sharing[a]	5.91	.82	- .24*	.10	.63*	
Cronbach's α			-	.95	.77	.71

Note. [a] Aggregated at team level.
* $p < .05$

Table 2: *Results of Multilevel Analysis – Study 1*

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
Step 1: Control Variables	**Beta**	**S.E.**	**Beta**	**S.E.**	**Beta**	**S.E.**	**Beta**	**S.E.**	**Beta**	**S.E.**	**Beta**	**S.E.**
Age	.02	.01	.02	.01	.02	.01	.02	.01	.02	.01	.02	.01
Gender	.12	.10	.12	.10	.12	.09	.12	.09	.13	.09	.13	.09
Tenure	.00	.02	.00	.02	.00	.02	.00	.02	.01	.02	.00	.02
Education level	.01	.02	.01	.02	.02	.02	.02	.02	.02	.02	.02	.02
Similarity of expertise to supervisor's	-.16	.10	-.10	.13	-.04	.12	.00	.12	-.01	.12	-.02	.12
Team size	.00	.01	.00	.01	.00	.01	.00	.01	.00	.01	.00	.01
Research center 1	.08	.17	.07	.11	.08	.17	.06	.16	.11	.18	.08	.16
Research center 2	.43**	.19	.43**	.13	.44**	.19	.43**	.19	.44**	.18	.22	.18
Step 2: Individual-level Variables												
Expertise dissimilarity			.05	06	-	-	-	-	-	-	-	-
Step 3: Testing the Slopes												
Expertise dissimilarity					.01	.08	.02	.08	.04	.08	.03	.07
Step 4: Individual-level Square Term												
Expertise-dissimilarity square							.08	.10	.08	.10	.12	.09
Step 5: Team-level Variables												
Tacit knowledge sharing (TKS)									-.09	.08	-.07	.09
Explicit knowledge sharing (EKS)									.14	.08	.12	.09
Step 6: Cross-level Two-Way												
EKS x TKS											-.02	.05
TKS x dissimilarity											.26**	.08
EKS x dissimilarity											-.26**	.08
Increase in model fit	$\chi2$ (9) = 14.37		$\chi2$ (1) = .06		$\chi2$ (1) = 3.87*		$\chi2$ (1) = .61		$\chi2$ (2) = 2.64		$\chi2$ (3) = 8.47*	
Δ R2	.18		.00		-		.01		.03		.08	

Note. * $p < .05$ Overall model adjusted R2: .30
** $p < .01$

Table 3

Descriptive Statistics, Correlations, and Reliability – Study 2

Variables	Mean	s.d.	1	2	3	4
1. Expertise dissimilarity	.31	.37				
2. Creativity	3.93	.67	-.13			
3. Tacit knowledge sharing [a]	5.95	.43	-.09	.02		
4. Explicit knowledge sharing [a]	6.01	.47	-.15	.03	.61**	
Cronbach's α			-	.95	.84	.81

Note. [a] Aggregated at team level.

* $p < .05$; ** $p < .01$

Table 4*: Results of Multilevel Analysis – Study 2*

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
Step 1: Control Variables	**Beta**	**S.E.**	**Beta**	**S.E.**	**Beta**	**S.E.**	**Beta**	**S.E.**	**Beta**	**S.E.**	**Beta**	**S.E.**
Age	.01	.03	.01	.03	.01	.03	.01	.03	.01	.03	.02	.03
Gender	-.02	.20	.01	.20	-.02	.17	-.02	.17	-.02	.17	-.01	.16
Tenure	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Education level	.03	.19	.00	.19	.03	.17	.03	.17	.05	.17	-.04	.17
Similarity of expertise to supervisor's	.20	.15	.13	.17	.05	.16	.05	.16	.08	.16	-.13	.17
Team size	.05	.04	.07	.05	.05	.03	.05	.03	.04	.03	.04	.03
Research center 1 [Firm 1]	.08	.17	.08	.18	.06	.22	.05	.22	.08	.22	-03	.24
Team identification (TI)	-.24	.22	-.20	.22	-.15	.29	-.19	.30	-.16	.32	-.23	.34
Team psychological safety (TPS)	.45	.26	.38	.26	.35	.34	.37	.34	.42	.36	.34	.34
Team climate for innovation (TCI)	.21	.42	.22	.42	.16	.55	.17	.55	.08	.55	.34	.53
Step 2: Individual-level Variables												
Expertise dissimilarity			.09	.09	-	-	-	-	-	-	-	-
Step 3: Testing the Slopes												
Expertise dissimilarity					.11	.09	.10	.09	.09	.09	.11	.10
Step 4: Individual-level Square Term												
Expertise-dissimilarity square							.05	.09	.06	.09	.05	.09
Step 5: Team-level Variables												
Tacit knowledge sharing (TKS)									.05	.11	.06	.11
Explicit knowledge sharing (EKS)									-.09	.12	-.10	.12
Step 6: Cross-level Two-Way												
EKS x TKS											.00	.09
TKS x dissimilarity											.22*	.11
EKS x dissimilarity											-.36**	.12
Increase in model fit	$\chi2$ (10) = 26.48**		$\chi2$ (1) = .92		$\chi2$ (1) = 11.77**		$\chi2$ (1) = .31		$\chi2$ (2) = .57		$\chi2$ (3) = 8.41*	
Δ R2	.28		.01		-		.00		.01		.09	

Note. * $p < .05$ ** $p < .01$ Overall model adjusted R2: .39

Team-level Tacit Knowledge Sharing	High Individual Creativity I	Low Individual Creativity II
Team-level Explicit Knowledge Sharing	Low Individual Creativity IV	High Individual Creativity III
	High	Low

Individual-level Expertise Dissimilarity

Figure 1. Integration of Expertise Dissimilarity and Tacit vs. Explicit Knowledge Sharing

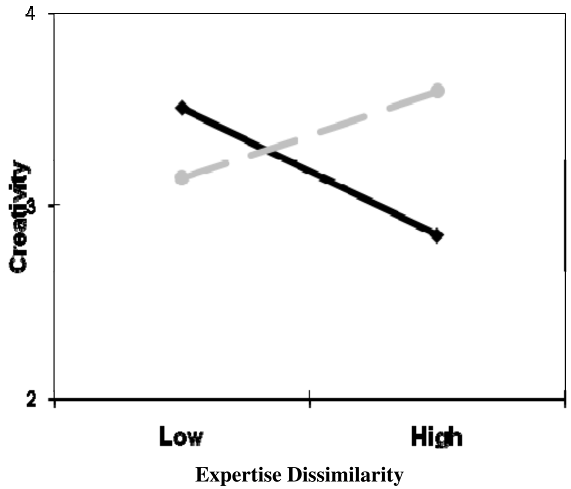

Figure 2A

High tacit knowledge sharing
Low tacit knowledge sharing

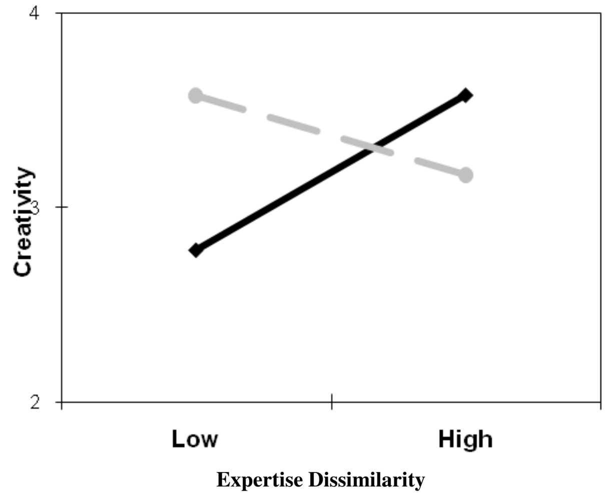

Figure 2B

High explicit knowledge sharing
Low explicit knowledge sharing

Figure 2. Tacit Knowledge Sharing and Explicit Knowledge Sharing Moderate the Link between Expertise Dissimilarity and Creativity (Study 1).

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