Linking Knowledge Sharing and Employee Creativity: Decomposing Knowledge Mode and Improving the Measure of Tacit Knowledge Sharing

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Abstract

Knowledge management (KM) has long been theorized as an important source of organizational competitive advantage. By developing dynamic capability of leveraging intellectual assets, an organization is expected to be able to innovatively respond to changing environment. However, the research streams of creativity and innovation on one hand and KM on the other hand have been surprisingly separate over the last decades. Specifying the sharing of two modes of knowledge, this study proposes and verifies a theoretical model linking creative process engagement with individual creativity via the mechanisms of tacit and explicit knowledge sharing. Using a two-wave survey design, we collected data from a sample of 194 employees and their supervisors. The results showed that three types of specific engagement in creative activities (i.e., problem identification, information searching and encoding, and idea generation) differentially and interactively affect employees’ creative behavior, in which processes tacit knowledge sharing and explicit knowledge sharing played different roles. Theoretical and practical implications are discussed.

Key words: Tacit knowledge sharing, explicit knowledge sharing, creativity, creative process engagement
1. BACKGROUND OF RESEARCH

In today’s unpredictable business environment, innovation and knowledge management (KM) have more and more been recognized to be critical to a firm’s competitiveness. Scholars in varied fields, including strategic management, organizational studies and information systems, believe that effective capturing and making use of a firm’s collective knowledge and expertise can stimulate and facilitate innovation, and further strengthen a firm’s competitive capability and enhance its performance (Farr, Sin, and Tesluk, 2003; Grant, 1996). As a consequence, an increasing number of contemporary firms have deployed various KM initiatives, including implementing knowledge management systems (KMS)—an information technology (IT)-based system for knowledge sharing, building organizational culture favorable to knowledge sharing, and other management interventions that encourage knowledge sharing practices within or across teams, units, and organizations (Alavi and Leidner, 2001; Bock et al., 2005; Voelpel and Han, 2005).

Although interest among both scholars and practitioners has grown rapidly over the last decades, the two streams—creativity and innovation on the one hand and KM on the other—are still surprisingly separate. While the assumption that intra-organizational KM could promote innovation has been taken for granted, paradoxically little research attention has been paid to “how” KM activities interact with creativity. One promising exemption is a controlled laboratory experiment by Cheung, Chau, and Au (2008) on the effect of knowledge reuse on individual creative performance. But this study only examines explicit knowledge reuse from an online knowledge repository. What would be the effect of contributing knowledge and share it with others on one’s creativity is still unknown.

The dysfunctionally disparate understanding of innovation and KM, coincidentally, has been reflected on the dilemma of KM in practice. Since the term of KM gives employees an impression that the firms are trying to take away their personally held knowledge and manage it as a pool of organizational resource, it has negative implications for employees: you are losing your valuable resource, and perhaps, advantages as well as status in the organization! Unsurprisingly, it has been reported that firms were largely disappointed with their investment in KMS due to employees’ reluctance or even resistance to knowledge sharing (He, Fang, and Wei, 2009).

Driven by the theoretical argument that creativity and KM are inseparable but the fact of lacking bridging research, and the practical need of justifying the individual benefits of knowledge sharing, this study aims to build and test an exploratory theory that addresses the connection between knowledge sharing and individual creativity. Creativity requires the support of knowledge—creativity itself is the result of knowledge creation (Wang and Noe, 2010). In the past decades, a large number of studies have investigated the antecedents of individual creativity. According to Amabile’s componential theory of creativity (1983), one of the most seminal works on creativity, domain knowledge, creativity-relevant skills, and intrinsic motivation are three major components of creativity. Recent research also finds that exposure to heterogeneous knowledge is found to improve both the creative potential of focal actors as well as work team’s innovation in general (Huang, Hsieh, and He, 2008; Tiwana and McLean, 2005; Wu, Tsai, and Wang, 2011). But the available research findings only demonstrate that I possess relevant knowledge (by whatever means, e.g., learn from a book, or learn from other people) is one prerequisite of being creative. We yet don’t know what the impacts on my creativity would be if I share my own knowledge with others. Will knowledge sharing behavior promote or inhibit my own creative performance? Moreover, will the sharing of two different modes of knowledge, namely tacit and explicit knowledge (Alavi and Leidner, 2001), have different effects on creativity? In light of the crucial role of KM in current organizational context (Kanawattanachai and Yoo, 2007), there is an urgent need to understand how encouraging people to share two types of knowledge to their coworkers may impact an individual employee’s own creativity.
In building a model linking knowledge sharing and creativity, we further drew on the recent creativity literature that examines the processes leading to creative outcomes (e.g., Shalley et al., 2004; Zhang and Bartol, 2010). Scholars find that individuals are more likely to be more creative when they spend more efforts or engagement in (1) problem identification, (2) information searching and encoding, and (3) idea and alternative generation (Zhang and Bartol, 2010). These three processes are essentially interrelated and have differentiated relationships with knowledge sharing behaviors. When individuals spend efforts on understanding and identifying a problem, they are likely to search for information and generate ideas. It is worth noting that information searching process is unnecessarily of one-way flow (i.e., a focal person seek for and further absorb the information from his or her colleagues). Rather, the information and ideas are often shared and exchanged among colleagues in an iterated way for accomplishing certain job tasks. So there are chances that engaging information searching and encoding process would lead people to sending one’s own knowledge to others. In the idea generation stage, it is common for people to talk with their family, friends and/or colleagues, seeking for their advice or support for example. Then, we tend to address two following important questions:

- Does sharing of knowledge with others increase one’s own creativity?
- If so, how creative process engagement relates with knowledge sharing and eventually leads to an individual’s more creative performance?

In answering the above questions, this study aims to advance the existing understanding and knowledge of creativity. Not only getting knowledge from others can increase individual creativity, giving knowledge to others in certain circumstances may also benefit the knowledge contributors themselves. Finally, the vast majority of existing literature has adopted cross-sectional design, whereas the effect of knowledge sharing on an individual’s creativity may be time-lagged. Thus, we present a two-wave research design that examines how three engagement processes of creativity are differentially and interactively associated with tacit knowledge sharing and explicit knowledge sharing, and further predict an individual’s creativity.

2. LITERATURE REVIEW

2.1 Tacit and Explicit Knowledge Sharing

Scholars have generally acknowledged that an individual employee is more likely to generate creative ideas if he/she can access diverse knowledge and information through interacting with other people with dissimilar expertise (Gibson and Gibbs, 2006; Sosa, 2011). Therefore, knowledge sharing is regarded an important process that allows diverse expertise to be “transferred” among different people, in particular, among team members or coworkers in workplace (Nonaka, 1994; Tiwana and McLean, 2005).

The aforementioned knowledge sharing actually implies the sharing of two distinct modes of knowledge specified by Nonaka (1994): tacit knowledge and explicit knowledge, respectively. Explicit knowledge refers to objective knowledge that can be articulated, codified, and expressed in formal and systematic language, such as documents, reports, and models; in contrast, tacit knowledge is the subjective knowledge that is difficult to formalize, articulate, and communicate, such as personal experiences, insights, and know-how (Alavi and Leidner, 2001; Lam, 2000; Nonaka, Toyama, and Konno, 2000). Nonaka (1994) further stated that tacit knowledge be comprised of both cognitive and technical elements. The cognitive element refers to an individual’s mental models, beliefs, paradigms, and viewpoints, while the technical element covers concrete know-how, crafts and skills that apply to a specific context (Alavi and Leidner, 2001). Therefore, tacit knowledge may not be easily codified, articulated, or transferred (Alavi and Leidner, 2001; Nonaka, 1994).

Although scholars generally value tacit knowledge more as the main source of competitive advantage, the literature exhibits variety in the definitions and conceptions of tacit knowledge (for a thorough review, see McAdam, Mason, and McCrory, 2007). Traditionally, scholars hold two different views on the sharing of tacit knowledge. One, drawing on Polanyi’s dictum that “we know more than we can tell” (Polanyi, 1966),
emphasizes that tacit knowledge is very personal in nature thus rather difficult to articulate to others. At extreme cases, even the holders of tacit knowledge do not even recognize that they possess it (Land and McGregor, 1987), which means tacit knowledge sharing is impossible. Another stream of scholars, however, believe that although tacit knowledge is difficult to formalize and communicate, individuals can share tacit knowledge through the participation in social practice or working under the guidance of more experienced people (Nonaka et al., 2000; Nonaka and von Krogh, 2009).

Extensive literature has elaborated the potential mechanisms of sharing tacit knowledge. In general, the sharing of tacit knowledge requires close interactions in order to develop a shared understanding that helps individuals to utilize others’ distinctive knowledge (Hansen, 1999; Hansen, Mors, and Løvås, 2005; Lam, 2000). Contextual information being conveyed during the interactions is helpful for the recipients to meaningfully comprehend and accurately interpret the tacit knowledge of the senders. Moreover, experience sharing can help individuals to understand each others’ thinking process and develop corresponding “interpretive schemes” that facilitate the assimilation and interpretation of the tacit knowledge of others (Haas & Hansen, 2005; Hansen, 1999; Markus, 2001). Based on the above arguments, we adopt the latter viewpoint that tacit knowledge sharing is viable, although it would be costly and takes long time.

When reviewing the literature in leading journals in the disciplines of strategic management, organizational studies, and information systems, it shows that scales measuring tacit knowledge sharing in existing research are largely fragmented and from different angles. Viewing tacit and explicit knowledge as two ends of a continuum, some measure the extent of tacitness of information/knowledge, such as whether it would be in writing or how well it is documented (Subramaniam and Venkatraman, 2001); some refer to the specific formats of knowledge shared such as whether it mainly includes reports or manuals (explicit) or expertise and/or experience (tacit) (Bock, Zmud, Kim, and Lee, 2005; Choi, Lee, and Yoo, 2010; Dhanaraj, Lyles, Steensma, and Tihiyli, 2004); some mix both approaches (Hansen, Mors, and Løvås, 2005; Levin and Cross, 2004). There are also a vast majority of existing literature that doesn’t distinguish tacit knowledge from explicit knowledge in measuring the knowledge sharing behavior (e.g., Choi et al., 2010; Gong, Cheung, Wang, and Huang, 2012; Kearney, Gebert, and Voelpel, 2009; Srivastava, Bartol, and Locke, 2006). Information systems researchers largely adopt the measure developed by Bock et al. (2005), which uses “experiences”, “know-how” and “expertise” to tackle tacit knowledge sharing. However, this scale appears inadequate in depicting and reflecting the specific mechanisms of tacit knowledge sharing, thus fails to justify itself when questioned by the research stream that is inclined to believe tacit knowledge non-transferable. The lack of a set of comprehensive, accurate, and fully captured scales measuring knowledge sharing, tacit knowledge sharing in particular, has hindered empirical investigation on an integrative framework of KM and creativity to some extent. In the following part, we build upon Nonaka’s (1994) dynamic theory of knowledge creation and prior literature to develop a measure of tacit knowledge sharing and explicit knowledge sharing at individual level, and further offer hypotheses about how the three creative engagement processes relate to the two types of knowledge sharing for the purpose of enhancing creativity.

2.2 Dynamic Theory of Organizational Knowledge Creation

Among the existing literature on knowledge sharing, Nonaka’s dynamic theory of organizational knowledge creation (1994) was obviously a seminal work. He proposed that knowledge is created through the sharing or conversion between tacit and explicit knowledge: (1) socialization, from tacit to tacit knowledge, (2) externalization, from tacit to explicit knowledge, (3) internalization, from explicit to tacit knowledge, and (4) combination, from explicit to explicit knowledge. The interactions and conversions of two modes of knowledge not only imply the possibility of tacit knowledge sharing among individuals, but also specify the corresponding mechanisms of sharing.

According to the knowledge creation theory (Nonaka, 1994), two of the four modes—socialization and externalization—are relevant mechanisms of tacit knowledge sharing. Therefore, we focus on these two
in this study. “Socialization” refers to the process of making tacit knowledge shared through interaction between individuals. In a shared working environment, an individual can acquire tacit knowledge by observation, imitation, and practice. “The key to acquire tacit knowledge is experience. Without some form of shared experience, it is extremely difficult for people to share each others’ thinking processes. (Nonaka, 1994: 19)” “Externalization” refers to the process of converting tacit knowledge into explicit knowledge, in which metaphor or demonstration turns to be an effective tool. Metaphor and storytelling are powerful conveyors of tacit knowledge (and its meaning) in such a way that “people drink in knowledge informally and, at times, unconsciously. (Swap, Leonard, Shields, and Abrams, 2001: 98)” Usually tacit knowledge is hard to be documented in reports or manuals, thus we regard demonstration with the intention of displaying certain skill be a kind of documentation in visual.

2.3 Creativity Theory

Creativity is generally defined as the generation of novel and valuable ideas involving better product, process, practice and problem solving (Amabile, 1983; Shalley and Zhou, 2008). Academics have devoted much attention to examining the antecedents of creativity (Zhou and Shalley, 2003). Early creativity researchers cataloged the biographical and historical data of eminent creators and tried to use such inventories to predict creativity. However, the complexity of the factors makes a theoretical explanation of the relationship between the biographic factors and creativity impossible (Barron and Harrington, 1981). Later on, a bunch of studies have focused on cognitive ability and tried to map its relationship with creativity. They found a number of aptitudes or skills relating to cognitive ability that positively relate to creativity.

Among the plenty of creativity research, two theories have received wide acceptance. The first one is Amabile’s componential theory of creativity (1983), which describes three major components of creativity: domain-relevant skills (also known as expertise or domain knowledge), creativity relevant skills and intrinsic task motivation (also known as task motivation or intrinsic motivation). Another one is the work by Ford (1996). He emphasizes creativity in organization contexts is the result of an individual (actor) interplaying with a context (situation). Ford postulates a creative individual action model and argues that creative or habitual action depends on the joint influence and interaction of sense-making, motivation and knowledge/ability.

3. RESEARCH MODEL AND HYPOTHESES

The focus of this study is to explore the theoretical explanations and empirical evidence of interactive relationships between knowledge sharing and the process of creative outcome generation. We argue that when individual employees engage in problem solving processes—identify problem, gather information from various sources, generate multiple ideas and evaluate the alternative solutions for implementation, they frequently interact with fellow colleagues to share relevant information and knowledge in not only “receiving” but also “giving” directions. With the accumulated knowledge resources, they are more likely to develop creative outcomes. Those employees who frequently involve in problem solving processes and share their findings with other colleagues will be more creative. The overall theoretical model, which underlines the above process, is presented in Figure 1. We below elaborate the hypothesized relationships to unfold how creative process engagement and knowledge sharing relate to each other in shaping employee creativity.

3.1 Knowledge Sharing and Creativity

The componential model of creativity (Amabile, 1983; 1988) suggests that domain knowledge is one of the most crucial components of creativity. Domain expertise and knowledge is the foundation of all kinds of creative work (Cheung et al., 2008). By interacting with others, employees can accumulate pooled informational resources relevant to their task or problem identified in the workplace, be exposed to a
variety of ideas and ways of thinking, and have higher chance of synthesizing the shared resources into a new body of domain knowledge, which facilitates creativity (Amabile and Khaire, 2008; Gong et al., 2012; Zhang and Bartol, 2010). High degree of knowledge sharing supports individual employee’s learning process and thus enhances an individual’s creative skills, another building block of individual creativity (Gong et al., 2012). Finally, integrating diverse expertise from multiple sources can foster higher level of creative work (Nonaka, 1994; Tiwana and McLean, 2005). Therefore, scholars generally believe that an individual employee is more likely to generate novel and creative ideas if he/she can access diverse knowledge and information by interacting with people who have variety of expertise (Gibson and Gibbs, 2006; Sosa, 2011). On the other hand, an individual employee will also be evaluated as creative if he/she share information and ideas with his/her fellow colleagues. That is, in order to be creative in the eyes of others within a company, an employee needs to let others know his/her experience and unique knowledge. The experiences and knowledge may be initiated by overcoming challenges via the three essential steps (problem definition, information searching and idea generation). New knowledge can be created through the sharing spiral of tacit and explicit knowledge, e.g., socializing own tacit knowledge with others, or externalizing own tacit knowledge to be explicit knowledge for delivery purpose (Nonaka, 1994). The “outward sharing (of knowledge) can improve one’s original idea (Gong et al., 2012, p.1617).” Thus, we propose:

Hypothesis 1. The sharing of (a) tacit and (b) explicit knowledge is positively related to employee creativity.

3.2 Creative Process Engagement and Knowledge Sharing

Creative-related activities frequently involve people with different knowledge backgrounds and expertise on one hand and communication and coordination processes on the other hand, for example, in new product development teams (Akgün et al., 2005). When employees are engaged in the process of searching information and idea generation, they first of all elaborate their problem—elaborate it to others clearly so that a shared context exists before they even discuss anything. Communicating information with others is one of important reflexivity processes (Tjosvold, Tang, and West, 2004). Therefore, people involved in creative processes may be more motivated to share their information and ideas with others before they can better evaluate the ideas and make a wise decision. Therefore, we argue that the higher degree an individual employee is engaged in information searching and idea generation processes, he or she is more likely to share tacit and explicit knowledge with others. So we come up with the following hypotheses:

Hypothesis 2. Engagement in information searching is positively related to (a) tacit knowledge sharing and (b) explicit knowledge sharing.

Hypothesis 3. Engagement in idea generation is positively related to (a) tacit knowledge sharing and (b) explicit knowledge sharing.

3.3 Three Creativity-relevant Processes

Defining problem in a clear and accurate way is the first step of being creative, ahead of searching and encoding information and idea and alternative generation (Zhang and Bartol, 2010). Only when employees have developed the understanding of a problem can they initiate targeted information searching and consequent evaluation of alternative solutions. The more information searching is conducted, the more alternative ideas and solutions may emerge. Therefore, we hypothesize:

Hypothesis 4. Engagement in the process of defining problem is positively related to (a) information searching and (b) idea generation.

Hypothesis 5. Engagement in information searching is positively related to idea generation.
4. METHODS

4.1 Pilot Study

As stated in the literature review, appropriate scales for tacit knowledge sharing were not available. Therefore, guided by prior inductive research on KM (Alavi and Leidner, 2001; Nonaka, 1994; Nonaka and von Krogh, 2009), we conceptualize knowledge sharing as a process of sharing an individual’s personal knowledge with others. Correspondingly, we measure tacit knowledge sharing by assessing the extent to which an individual delivers one’s own tacit knowledge, both cognitive and technical, to other team members or coworkers in a shared working environment. There exist few divergences and variations regarding the measurement of explicit knowledge sharing. Therefore, this study follows the two-item scale by Bock et al. (2005) to measure explicit knowledge sharing.

Three academic scholars who are experienced in KM independently reviewed the newly developed items specifying the mechanisms of tacit knowledge sharing. Later on they had a face-to-face discussion and shared their comments and opinions. Several items were rephrased for clarity in their meaning. A few vague expressions were revised and the whole set of questions were purified. Next, the items underwent a second round of refinement after focus group discussions with six professionals who have been supervising multiple subordinates in a collaborative work environment. These professionals have also been extensively engaged in and promoting knowledge sharing among their subordinates and other colleagues. From the feedback of the six professionals, the measuring items as revised from the academic scholars were clear and understandable in their meanings. This included six items for tacit knowledge sharing. Each item was measured using a 7-point Likert scale (anchors: 1—strongly disagree, to 7—strongly agree).

As the last step of iterative procedure of scale development, we pilot-tested the proposed measure using a sample of 105 individuals from five firms located in two major cities of China, one in the south and the other in the west. The descriptive information of the samples in pilot study is showed in Table 1. The mean age of respondents was 31 years (s.d. = 4.9), and the mean organizational tenure was 6.2 years (s.d. = 6.1). Out of this sample, 86.6% of the respondents were male.

Table 2 presents the descriptive statistics and internal consistency of the measures of tacit knowledge sharing and explicit knowledge sharing. Cronbach’s alpha levels were both greater than the recommended .70 (Nunnally, 1978), and thus comfortably demonstrate internal consistency of measurement.
<table>
<thead>
<tr>
<th>Region</th>
<th>Industry Type</th>
<th>Respondents</th>
<th>Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm 1</td>
<td>West China</td>
<td>Manufacturing</td>
<td>15</td>
<td>14.3</td>
</tr>
<tr>
<td>Firm 2</td>
<td>West China</td>
<td>Manufacturing</td>
<td>26</td>
<td>24.8</td>
</tr>
<tr>
<td>Firm 3</td>
<td>West China</td>
<td>Extractive</td>
<td>12</td>
<td>11.4</td>
</tr>
<tr>
<td>Firm 4</td>
<td>South China</td>
<td>Financial</td>
<td>22</td>
<td>21.0</td>
</tr>
<tr>
<td>Firm 5</td>
<td>South China</td>
<td>Electronic / IT</td>
<td>30</td>
<td>28.6</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>105</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 1. Descriptive information of respondents in terms of Firms

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>s.d.</th>
<th>Cronbach’s α</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Tacit knowledge sharing</td>
<td>5.51</td>
<td>.62</td>
<td>.77</td>
</tr>
<tr>
<td>2. Explicit knowledge sharing</td>
<td>5.15</td>
<td>3.11</td>
<td>.76</td>
</tr>
</tbody>
</table>

Table 2. Descriptive statistics and reliabilities

The measurement model for tacit and explicit knowledge sharing was further analyzed using a factor analysis with a varimax rotation. Two factors were satisfactorily emerged. No item cross-loaded on the opposite dimension at a level higher than 0.33 (see Table 3). Thus, we consider the newly developed measurements of knowledge sharing possess good internal consistency. In the following part, we report a two-wave design that utilizes the newly developed measure of knowledge sharing to examine the interrelations of creative process engagement and tacit and explicit knowledge sharing and how they work on individual creativity.

<table>
<thead>
<tr>
<th>Item</th>
<th>Tacit Knowledge Sharing</th>
<th>Explicit Knowledge Sharing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I share my hands-on experiences and perspectives through dialogue and interactions with others colleagues / team members.</td>
<td>.75</td>
<td>-.10</td>
</tr>
<tr>
<td>2. I share my expertise with others by jointly working with them in a specific working context.</td>
<td>.70</td>
<td>.21</td>
</tr>
<tr>
<td>3. I share my practical know-how, crafts, and specialized skills (for carrying out daily tasks) with others through apprenticeship or mentorship.</td>
<td>.65</td>
<td>.06</td>
</tr>
<tr>
<td>4. I share with others my philosophy, values, beliefs, and viewpoints (that I used to perceive and define the world) based on my own, distinctive, ineffable background of experiences.</td>
<td>.56</td>
<td>.04</td>
</tr>
<tr>
<td>5. Using metaphors and storytelling, I share my intuition or rules of thumb in a concrete manner and share it with other colleagues.</td>
<td>.71</td>
<td>.11</td>
</tr>
<tr>
<td>6. I teach others through demonstrating the craftsmanship and expertise.</td>
<td>.57</td>
<td>.33</td>
</tr>
<tr>
<td>1. I share my work reports, official documents, and self-explanatory software with others.</td>
<td>.07</td>
<td>.82</td>
</tr>
<tr>
<td>2. I share my well-documented manuals, methodologies and models with others.</td>
<td>.24</td>
<td>.77</td>
</tr>
</tbody>
</table>

Table 3. Factor loadings for factor analysis of tacit/explicit knowledge sharing
4.2 Sample and Data Collection

The main study consisted of two waves of questionnaires, and data were collected from two sources. We collected data from one Top 500 global corporations located in China. The company has telecom operations in more than 30 provinces in China and has branches in the United States and Europe. As in the end of 2009, the company had 670 thousands employees around the world and its total asset was beyond 600 billion RMB. A two-wave design was employed to test the hypothesized relationships among variables. At time 1, we distributed survey questionnaires to 270 randomly sampled employees from seven branches in a major province. The employees mainly answered questions regarding their own engagement in creative process and knowledge sharing behavior. Four months later (time 2), with the endorsement of the company, we sent a short questionnaire to 55 matched supervisors of sampled employees. The supervisors were asked to rate the creativity of those employees under their supervision. This time-lagged research design is helpful to reveal the causality mechanism that employee creativity is a consequence of creative process engagement and knowledge sharing (Liang, Farh, and Farh, 2012).

After removing the responses with missing data, we finally received 194 usable employee responses with matched creativity evaluation, yielding a 71.9 percent response rate. Male and female were coincidentally 50/50 sampled. The mean age was 35.5 years (standard deviation = 5.7). The majority of them were college educated (75.8%). Due to our random sampling method, the sampled employees were distributed in various functional units, including accounting, marketing, customer service, IT, administration, etc.

4.3 Measures

As illustrated before, the six items developed in the pilot study were used to assess tacit knowledge sharing. Two items adapted from Bock et al. (2005) were used to measure explicit knowledge sharing. For the rest key variables in the research model, we used well-established measures in the creativity literature. Specifically, creative process engagement was measured by 11 items by Zhang and Bartol (2010). The respondents were asked: “In your job, to what extent do you engage in the follow actions when seeking to accomplish an assignment or solve a problem?” (1= “never”, to 5= “very frequently”). Out of the 11 items, 3 are designed to evaluate problem identification. A sample item is, “I spend considerable time trying to understand the nature of the problem.” 3 items are about information searching and encoding, and a sample question is, “I search for information from multiple sources.” And 5 items are used to measure idea generation. Sample items include “I generate a significant number of alternatives to the same problem before I choose the final solution” and “I try to devise potential solutions that move away from established ways of doing things.” Employee creativity was measured with the 13-item scale developed by Zhou and George (2001). A sample question is, “This employee suggests new ways to achieve goals or objectives (1, “not at all characteristics” to 5, “very characteristics”). We also included age, gender, educational level, and novice level in the current job position as control variables.

All measures were originally in English and then carefully translated into Chinese using the translation and back translation procedure suggested by Brislin (1980).

5. DATA ANALYSIS

Partial Least Squares (PLS) was used to examine the measurement model and structural model. PLS is an appropriate statistical tool when theory exploration, extension, or prediction is the aim of research (Jöreskog and Wold, 1982), as is the case with this study. Unlike standard linear regression, PLS does not require multivariate normality when estimating parameters and it also does not require large sample sizes compared to other structure equation modeling techniques (Chin, Marcolin, and Newsted, 2003). SmartPLS was used to test the proposed model and hypotheses.
5.1 The Measurement Model

The measurement model was assessed by examining internal consistency, discriminant validity, and convergent validity of key variables. As reported in Table 4, all the Cronbach’s alpha and composite reliability values are greater than 0.7, confirming the reliability of the measurement model. The average variances extracted by the measures, indicating the average amount of variance that a construct captures from its indicators relative to the amount owing to measurement error, range from 0.56 to 0.81, all above the recommended 0.5 threshold (Chin, 1998; Fornell and Larcker, 1981). The square root of the average variance extracted for each construct is greater than the inter-construct correlations, as shown in Table 5. The descriptive results of the key variables are also included in Table 5.

<table>
<thead>
<tr>
<th>No.</th>
<th>Variables</th>
<th>Mean</th>
<th>S.D.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Define Problem</td>
<td>5.41</td>
<td>0.89</td>
<td>0.90*</td>
<td>0.81</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Information Searching</td>
<td>5.73</td>
<td>0.73</td>
<td>0.72</td>
<td>0.89</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Idea Generation</td>
<td>5.30</td>
<td>0.83</td>
<td>0.81</td>
<td>0.73</td>
<td>0.84</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Tacit Knowledge Sharing</td>
<td>5.72</td>
<td>0.66</td>
<td>0.36</td>
<td>0.39</td>
<td>0.40</td>
<td>0.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Explicit Knowledge Sharing</td>
<td>5.61</td>
<td>0.93</td>
<td>0.20</td>
<td>0.17</td>
<td>0.20</td>
<td>0.37</td>
<td>0.89</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Creativity</td>
<td>5.09</td>
<td>1.04</td>
<td>0.07</td>
<td>-0.03</td>
<td>0.04</td>
<td>-0.03</td>
<td>0.20</td>
<td>0.87</td>
</tr>
</tbody>
</table>

*The diagonal values are square roots of average variance extracted.

Table 4. The measurement model

Table 5. Correlations and intercorrelations between constructs

5.2 The Structural Model

Given the fact that two different rating scales in a single research (tacit and explicit knowledge sharing were measured using 7-point scale while other constructs were measured using 5 point scale, for the sake of being honest to the original source), we used standardized values in analyzing the data. Figure 2 presents the results of hypothesis testing. The model explained 11.3% of the variance of employee creativity. Hypothesis 1a was surprisingly not supported ($\beta = -0.125$, $t = 1.274$), suggesting that sharing tacit knowledge with others was negatively associated with employee creativity but the relationship was insignificant. On the other hand, Hypothesis 1b was supported ($\beta = 0.242$, $t = 1.744$), showing that individuals’ explicit knowledge sharing with others positively relates to their creativity. Hypothesis 2a, which states information searching process positively relates to tacit knowledge sharing, was supported ($\beta = 0.209$, $t = 1.994$). However, we didn’t find a significant impact of information searching on explicit knowledge sharing, thus Hypothesis...
2b was not supported. The positive effect of idea generation process on tacit knowledge sharing ($\beta = 0.248$, $t = 2.606$) was supported but its effect on explicit knowledge sharing ($\beta = 0.174$, $t = 1.548$) was not supported, therefore confirming Hypotheses 3a but not 3b. Meanwhile, Hypotheses 4a and 4b were strongly significant, indicating that engaging in defining problem is positively associated with information searching ($\beta = 0.724$, $t = 19.202$) and idea generation ($\beta = 0.588$, $t = 9.515$). Thus, Hypothesis 5, which predicts that information searching process has a positive impact on idea generation, was also supported ($\beta = 0.302$, $t = 4.477$). All control variables (age, gender, education level, and novice level) didn’t influence employee creativity significantly.

**Figure 2. Results of structural model analysis**

*Notes: Solid lines mean path coefficients are significant; dotted lines mean not significant.

$^* p<0.1$  $^{**} p<0.05$  $^{***} p<0.01$

6. **DISCUSSION**

This study distinguishes the sharing of two modes of knowledge, i.e., tacit knowledge and explicit knowledge. Building upon Nonaka’s dynamic theory of knowledge creation (1994), we developed and validated a more rigor measure of individual-level tacit knowledge sharing by specifying its various mechanisms. Using the refined measure, we set out to explore how creativity-relevant processes—information searching and idea generation specifically—differentially relate to tacit knowledge sharing and explicit knowledge sharing. The results of our research showed that engaging in creative process activities does not have an equal effect on knowledge sharing behavior; instead, they exert unique influences on different types of knowledge sharing, and further relate to employee creativity.

The results of our study yield several important findings. First, we found that sharing explicit knowledge with others stimulates the employees’ creative outcomes, while sharing tacit knowledge with others does not, even may tend to hamper one’s creativity. Although scholars as well as practitioners widely believe that sharing tacit knowledge within a firm can be beneficial to work performance and firm competitive advantage, surprisingly passing his/her expertise and unique skills to others may hinder an individual employee’s own creativity. This result may be explained from the perspective of costs. Tacit knowledge sharing requires intensive social interactions between knowledge senders and receivers, thus extra cognitive efforts, time, and other resources are demanded (Carlile, 2004; Haas and Hansen, 2007; Nonaka, 1994). The substantial interactions make the efforts and resources consumed, which could otherwise be utilized for the creation of novel ideas and solutions (Huang et al., 2008). On the other hand, sharing explicit knowledge with others does not require significant resources for processing contextual information and unique experience, thus won’t lead to effort and resource conflict with new knowledge
creation. Prior literature has concluded that referencing and reusing the codified explicit knowledge does not necessarily improve a person’s performance (Haas and Hansen, 2007), even worse, could weaken individual creative performance (Cheung et al., 2008). Our finding however suggests “giving” explicit knowledge through the simple sharing may generate unexpected return for knowledge senders. One possible mechanism of this beneficial result is that by transferring codified knowledge to others, individual employees may take the chance to combine it with other existing intellectual properties or get inspired in their mind, which are “combination” and “internalization” modes of new knowledge creation in Nonaka’s theory (1994). This empirical study thus makes one further step to bridge the two less-connected areas—knowledge sharing and individual creativity.

Second, the two creativity-relevant process activities, namely information searching and idea generation, have different interrelations with the two types of knowledge sharing: information searching has positive relationship with tacit knowledge sharing but not with explicit knowledge sharing, whereas idea generation is significantly associated with both tacit and explicit knowledge sharing. As we elaborated in above hypotheses development, employees engaging in creative process activities are likely to go to other colleagues seeking for useful information and knowledge. While prior work has shown that getting complementary knowledge and further integrating it for creative outcomes (Tiwana and McLean, 2005), we demonstrate that, in addition to acquiring knowledge from others, creative process engagement also promotes an employee’s sharing one’s own knowledge with others. Nevertheless, our findings only restricts to tacit knowledge sharing induced by information searching. Perhaps people are less easy to document what they find and share with others.

Third, we extend Zhang and Bartol’s work (2010) by examining the interrelations of three creativity-relevant process activities. Treating creative process engagement as a superordinate second-order construct comprised of three formative dimensions, Zhang and Bartol (2010) did not consider the three activities separately. When exploring their differential relationships with knowledge sharing, we tested and verified the three process activities’ interactive nature, that is, define problem is the antecedent activity, followed by information searching and consequent idea generation. Precisely identifying a problem is the basis of problem solving, thus an essential and important step, sometimes even more important than searching for information and making solutions. Raise right questions need a thorough understanding of the problems and finding the crucial point to direct the following information collection and solution development. The three activities are related to each other and predict creative outcomes.

### 6.1 Theoretical Contributions and Managerial Implications

The current study has major implications for research on knowledge management and creativity. First, this study extends prior work by theoretically developing and empirically testing the refined measurements of tacit knowledge sharing. With the concrete sharing mechanisms identified, the new measure provides a useful tool for future scientific research on exploring specific KM phenomenon. Second, it is essential to understand the interplays between knowledge sharing and an individual’s engagement in creativity-relevant process activities and how they predict individual creativity in the end. In this respect, this study makes a good trial in bridging KM and creativity theories, the two inextricably linked research fields. While prior literature treats knowledge sharing as a consequent activity of creativity (Bartol and Srivastava, 2002), the current research is the first to elicit more attention on how sharing knowledge with others leads to individual’s own creativity. Our findings further underscore the need to treat tacit knowledge sharing and explicit knowledge sharing separately and examine their unique impacts in future studies. Third, the early study on the effect of explicit knowledge reuse on individual creativity uses student samples in laboratory experiment setting. The present research employed time-lagged, two-source of data collection design to test the relationships between KM and creativity in organizational setting. It thus allows the confidence of predicting causality of the relationship between knowledge sharing and creativity outcomes.

A key implication of our study is that tacit knowledge sharing and explicit knowledge sharing have
distinct impacts on employee creativity. It may shed a light on the dilemma in KM practice in the industry. Considering from the perspective of benefit and cost of sharing knowledge, managers are recommended to carefully guide employees with different task roles in KM championship. Since the sharing of tacit knowledge requires tremendous time, efforts, and resources, it may be detrimental to those employees who are expected to generate new ideas or create new solutions (such as R&D staffs, marketing proposer, or consultants etc.). On the contrary, simple exchange of explicit knowledge between coworkers takes little cost but may enjoy the benefits in terms of developing a new understanding of, and insight into, one’s existing knowledge resources, therefore helps an employee become more creative.

Managers can also pay attention to cultivating a favorable atmosphere of creative process engagement, particularly the activity of problem identification. Our study reveals that employees need to be deeply engaged in the three related process activities. Although a large number of antecedent predictors of creativity have been proposed and empirically validated, for the practitioners, influencing employees to be engaged in specific activities is at least a relatively realistic and viable means to enhance creativity compared to the school of factors emphasizing personal traits.

6.2 Limitations and Directions for Future Research

First, the small R-square of proposed research model indicates that knowledge sharing can only explain 11.3% of the variance of employee creativity. Compared to the IS studies, the explanatory power of our model seems to be limited. However, R-square values above 0.05 are generally regarded acceptable in creativity literature. Since the focus of this study is to explore the relationships between knowledge sharing and creativity, we didn’t theorize and measure other potentially influential predictors of individual creativity. Future studies are suggested to include other factors such as creative self-efficacy (Gong, Huang, and Farh, 2009; Tierney and Farmer, 2002), intrinsic motivation (Amabile, 1983; Zhang and Bartol, 2010), and some contextual factors (Ford, 1996).

Second, we limited knowledge sharing to “giving” instead of bi-directional interactions between two parties. To have a full picture of how knowledge sharing influences creativity, future research should measure both scenarios of giving knowledge to and receiving knowledge from coworkers.

Third, the data were collected within one company, which makes the external validity of our results unexamined. More diversified research settings are needed to test whether the significant relationships in this study remain established. However, because the samples in our study covered different functional employees, we expect that the theoretical model and relationships can be broadly applied to other organizational settings.

Fourth, our study was conducted in China, where people are generally believed to be more collectivism-oriented and less creative than westerners. So the findings regarding the interplays between creative process engagement, knowledge sharing, and individual creativity may be specific to this cultural context. Future research should consider other countries and cultures to see whether our findings can be replicated.
References


