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Effects of team knowledge management on the creativity and financial performance of organizational teams

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ABSTRACT

An increasing number of organizations are turning to teams for innovation and creativity. The present study investigated the effects of team knowledge management (TKM) on the creativity and financial performance of organizational teams. Our analysis of data collected from 65 sales teams, across 35 branches of a Korean insurance company, showed that team knowledge utilization (but not team knowledge stock) was positively related to team creativity, which in turn predicted team financial performance over the 6-month period. The positive effects of knowledge utilization were stronger when team leaders had a systematic cognitive style and when teams were exposed to high environmental uncertainty. Furthermore, the systematic cognitive style of leaders had a positive main effect on team creativity and positively moderated the relationship between team knowledge stock and team creativity. The implications of these findings were considered, and some possible directions for future research were suggested.

Introduction

With the increasing appreciation of teams as the source of innovations (De Dreu & West, 2001; Nijstad & De Dreu, 2002), creativity in group settings has gained increasing research attention (Lopez-Cabrales, Pérez-Luño, & Cabrera, 2009). Working in teams is expected to lead to more novel associations and creative outcomes because of the broader set of perspectives available to members and the cross-fertilization of ideas (Perry-Smith & Shalley, 2003; Tesluk, Farr, & Klein, 1997). Team creativity can be defined as the generation of novel and appropriate ideas, solutions, or processes in the context of team objectives (Amabile, 1996). Because the initial interest in team creativity originated from the brainstorming paradigm (Osborn, 1957), researchers have often compared and contrasted idea-generation processes involving groups and individuals primarily in laboratory settings (e.g., Nijstad & Stroebe, 2006; Paulus & Dzindolet, 1993). Although these studies reveal drawbacks of team creative processes, such as free riding and evaluation apprehension (Diehl & Stroebe, 1991; Paulus, 2000), interest in team creativity among scholars and practitioners has continued to grow (Anderson, De Dreu, & Nijstad, 2004).

Extant studies of team creativity have highlighted the importance of group composition and team emergent states or processes, such as a supportive climate (Gilson & Shalley, 2004), intra-team communication (Leenders, Van Engelen, & Kratzer, 2003), and team conflict (Chen, 2006). These studies presumed that a heterogeneous membership provides teams with diverse information and knowledge, and that certain team processes promote the efficient flow and exchange of such information and knowledge (Anderson et al., 2004; Hülsheger, Anderson, & Salgado, 2009). Thus, researchers have acknowledged that the ability of a team to generate novel and useful ideas is inextricably linked to task-relevant knowledge embodied in members (Lopez-Cabrales et al., 2009) as well as to the adroit exploitation of knowledge by the team (Zahra & George, 2002). In explaining individual creativity, Amabile (1996) emphasized similar dimensions, such as domain-specific knowledge and creative processes, that promote the utilization of knowledge (cf. Choi, Anderson, & Veillette, 2009). Based on the literature, we propose that team creativity is positively related to team knowledge management (TKM), which includes the presence of knowledge within a team (*team knowledge stock*) and the process of using such knowledge (*team knowledge utilization*).

To understand the way teams use knowledge in performing their tasks, researchers have proposed several theoretical approaches, such as transactive memory systems (TMS; Liang, Moreland, & Argote, 1995), shared mental models (SMM; Mohammed, Klimoski, & Rentsch, 2000), and prior experience (Gino et al., 2009). Studies have shown that all of these are meaningful predictors of group performance (Austin, 2003; Mathieu, Goodwin, Heffner, Salas, & Cannon-Bowers, 2000). Nevertheless, empirical support for the effects of TKM on team creativity is

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generally lacking. Our study examines such effects in a sample of organizational teams.

We also propose that the relationship between TKM and team creativity is moderated by internal and external factors. First, we identify cognitive problem-solving styles (either intuitive or systematic) as a moderator of the TKM–creativity relationship, because creativity involves the cognitive manipulation of information, and the cognitive process of a team can be shaped by the cognitive orientation of its constituents, particularly the leader of the team (Sosik, Avolio, & Kahai, 1997). Cognitive styles involve stable individual differences in perceiving and processing information and experiences that ultimately affect how people feel, think, and act (Sagiv, Arieli, Goldenberg, & Goldschnidt, 2010). An intuitive cognitive style is a tendency to simultaneously analyze information from various perspectives (Scott & Bruce, 1995). In contrast, a systematic cognitive style is a tendency to analyze a situation based on logic and intention (Sagiv et al., 2010). The cognitive styles of team leaders may stimulate the creative thinking of members, and thereby facilitate the identification and utilization of knowledge for creative problem solving by the team (Shin & Zhou, 2007; Taggar, 2002). Second, based on institutional theory, which highlights the role of the external environment in shaping the operations of work units (Anderson & Tushman, 2001), we posit that the TKM–creativity link can be moderated by the operational context of teams. By providing greater group-wide motivation to search for new ideas and fully exploit knowledge, for example, environmental uncertainty may strengthen the effects of TKM on creativity.

Finally, responding to the call for research on the performance implications of creativity (Shalley, Zhou, & Oldham, 2004), we examine the effects of team creativity on team financial performance. Studies of team creativity have focused mostly on antecedents or processes that foster creativity (Hülsheger et al., 2009), reflecting the underlying assumption that creativity is beneficial to performance. In this study, we propose that TKM enhances performance by providing creative solutions to teams. Our theoretical model is empirically validated using multi-source, longitudinal data collected from 65 teams in a large insurance company in Korea.

Team knowledge management and team creativity

The literature on knowledge management can be divided into two streams: the content approach and the process approach. Studies based on the content approach focus on the types and characteristics of knowledge, such as domain-relevant skills (Martin & Parboteeah, 2007), tacit versus explicit knowledge (Griffith & Sawyer, 2010), and procedural versus declarative knowledge (Akgün, Dayan, & Di Benedetto, 2008). In contrast, research based on the process perspective focuses on the way knowledge is handled, shared, and utilized among individuals (Gino et al., 2009; Tiwana & McLean, 2005). Similarly, previous studies of team knowledge have assumed that knowledge content provides the raw materials for generating new knowledge (Cruz, Perez, & Ramos, 2007; Mathieu & Schulze, 2006), whereas knowledge processes enable teams to apply relevant knowledge and thus activate the value of such knowledge in team performance (Liang et al., 1995; Moreland & Myaskovsky, 2000).

Shared mental models (SMM) reflect the content approach and suggest that the shared mental representation of team tasks, roles, and attitudes promotes team effectiveness by improving coordination and the formation of normative principles for collective efforts (Klimoski & Mohammed, 1994; Mohammed et al., 2000). Employing both the content and process approaches, Wegner (1986) proposed a theory of transactive memory systems (TMS). These systems include the knowledge possessed by each individual, along with a collective awareness of who knows what. In subsequent TMS studies, researchers have focused mostly on the latter component and examined the processes that enable teams to identify and efficiently apply the knowledge distributed among members (Liang et al., 1995; Moreland, 1999). Similarly, team learning (Wilson, Goodman, & Cronin, 2007) involves the process of cross-fertilization among team members, thereby encouraging the flow of ideas within the team. Due to the focus of existing studies on the process of acquiring and sharing team knowledge, the literature has provided insufficient information on the function of knowledge content in teams (cf. DeChurch & Mesmer-Magnus, 2010).

Considering both the content and process approaches, we focused on two TKM elements: team knowledge stock and team knowledge utilization. Based on previous studies (Austin, 2003; Wegner, 1986), we define team knowledge stock as a combination of task-relevant knowledge and skills possessed by members and the leader within a team. This reflects the content dimension of TKM. Processes related to team knowledge, such as TMS or team learning, consider the way team knowledge stock is applied to team tasks (Moreland, 1999; Moreland & Myaskovsky, 2000). Therefore, we propose team knowledge utilization as an overarching construct that indicates the extent to which the pool of available knowledge and expertise is activated and exploited within teams. This reflects the process dimension of TKM. The two TKM dimensions are likely to improve team creativity by offering team members a greater supply of task-related information and knowledge, which are the raw materials for creativity (Paulus, 2000; Taggar, 2002; Taylor & Greve, 2006), and by promoting the application and utilization of knowledge in teams (Gino, Argote, Miron-Spektor, & Todorova, 2010; Gino et al., 2009).

Team knowledge stock

A larger knowledge reservoir gives teams the ability to accurately evaluate the value of new information and opportunities (De Dreu & West, 2001). Hence, by providing rich cognitive resources and by making diverse approaches available, a greater team knowledge stock offers more opportunities to recombine existing information and ideas, and to generate novel solutions for problems encountered (Paulus, 2000; Tiwana & McLean, 2005). The presence of a substantial reservoir of task-related knowledge may thus be a necessary condition (although it may not be a sufficient condition) for teams to develop innovative solutions to achieve their goals (Martin & Parboteeah, 2007; Taylor & Greve, 2006).

Hypothesis 1. Team knowledge stock is positively related to team creativity.

Team knowledge utilization

Researchers have noted that the mere presence of knowledge within teams does not necessarily improve performance if such knowledge is not applied nor utilized (Austin, 2003; Griffith & Sawyer, 2010). Only through the utilization of knowledge resources can team members access, explore, and exploit the knowledge that they possess (Tiwana & McLean, 2005). Such utilization enhances awareness of the problem at hand by team members, thereby leading to an in-depth processing of relevant information (Smith & O'Neil, 2003). Furthermore, efforts by team members to effectively utilize their knowledge base stimulates proactive learning, which allows higher-order forms of thinking to occur. These are needed for the elaborate analysis and synthesis of current issues (Choi,

2006; Gino et al., 2010). Sophisticated forms of learning and thinking, spurred by knowledge utilization, may increase the ability of teams to identify novel and practical solutions.

Hypothesis 2. Team knowledge utilization is positively related to team creativity.

Moderating effects of the cognitive styles of leaders

Due to the significant influence of leaders on group processes and effectiveness, the creativity literature has identified various leadership behaviors, such as supportive, participative, and transformational leadership, as positive predictors of individual creativity (Shalley et al., 2004). In analyzing the effects of leaders at the group level, we consider the cognitive styles of leaders as a team-level moderator of the TKM–creativity relationship. Extant studies (e.g., Scott & Bruce, 1995) of cognitive styles have focused mostly on how an individual's cognitive style can affect his/her own creativity. Given the pertinence of cognitive styles to the creative process (Taggar, 2002), the cognitive styles of leaders can probably shape how TKM affects team creativity. In this respect, we examine the intuitive and systematic cognitive styles of leaders, which reflect their distinct problem-solving styles (Sagiv et al., 2010). The two cognitive styles, however, are not mutually exclusive; thus, some leaders may exhibit both styles (Kirton & De Ciantis, 1986).

Intuitive cognitive style

Individuals with an intuitive problem-solving style analyze a given situation as an overall pattern, using various perspectives; they are not constrained by logic or rules (Sagiv et al., 2010; Scott & Bruce, 1995). Similar to transformational leaders, who use inspirational appeals to challenge the traditional ways of doing things (Gong, Huang, & Farh, 2009), intuitive leaders may encourage team members to shift their perspectives by freeing them from rules and standards (Sarin & McDermott, 2003). This can improve the capacity of members to recombine various components of their knowledge reservoir, making it possible to discover new solutions. Intuitive leaders also model and promote cognitive flexibility and divergent thinking. Hence, they raise member awareness of previously unnoticed associations among various kinds of information, resulting in the full utilization of team knowledge resources for creative problem solving (Shin & Zhou, 2007; Sosik et al., 1997). Thus, intuitive leaders unleash the potential of TKM for team creativity by increasing the value of the knowledge in teams and by facilitating team knowledge utilization.

Hypothesis 3. The intuitive cognitive style of leaders moderates the relationship between TKM and team creativity, such that the relationship is stronger when the intuitive style of leaders is strong than when it is weak.

Systematic cognitive style

Individuals with a systematic cognitive style follow clear procedures and precise instructions when performing tasks (Monnavarrian, 2002; Scott & Bruce, 1995). Leaders with this style are thus similar to directive leaders, in that they attempt to clearly organize the roles and responsibilities of members (Pearce & Sims, 2002). Given that systematic leaders expect team members to follow well-defined procedures and task instructions, members may become cautious about exploring unconventional approaches, and thus tend to perform their tasks within leader-imposed boundaries. Accordingly, systematic leaders issue a detailed order and impose clear structure around the tasks, which likely motivates members to comply passively (Ryan & Deci, 2000). Under such circumstances, the task-related knowledge and skills of members are less likely to be translated into creative solutions. Moreover, a systematic leader may channel the knowledge utilization process toward establishing routines and standard operating procedures, instead of experimenting with novel knowledge combinations. Therefore, a systematic cognitive style may limit the beneficial effects of TKM on team creativity.

Hypothesis 4. The systematic cognitive style of leaders moderates the relationship between TKM and team creativity, such that the relationship is weaker when the systematic style of leaders is strong than when it is weak.

Moderating effect of environmental uncertainty

Environmental uncertainty refers to the extent to which the business environment is unpredictable and unfamiliar, and thus potentially threatening (Bstieler, 2005; Rueda-Manzanares, Aragón-Correa, & Sharma, 2008). Environmental uncertainty has been examined mostly in organization-level, strategy-oriented studies (Anderson & Tushman, 2001). We examined how the internal processes and outcomes of teams are affected by the level of uncertainty in their task environment. Specifically, we propose environmental uncertainty as a moderator of the TKM–team creativity relationship.

Under environmental uncertainty, decision makers cannot confidently predict future events; consequently, there are ambiguities regarding appropriate ways of dealing with external contingencies (Anderson & Tushman, 2001). Group members have to experiment with various approaches in successfully responding to unpredictable conditions (Bstieler, 2005). Under greater environmental uncertainty, task-relevant knowledge and information become more critical for team functioning, and effective TKM plays a more important role in team creativity (Mathieu et al., 2000). In addition, team members need to more effectively exploit available knowledge to successfully cope with fluid environmental demands (Aragón-Correa & Sharma, 2003; Rueda-Manzanares et al., 2008). Thus, the value of team knowledge stock and knowledge utilization in generating novel and plausible ideas is more pronounced when teams are embedded in more uncertain task environments.

Hypothesis 5. Environmental uncertainty moderates the relationship between TKM and team creativity, such that the relationship is stronger when environmental uncertainty is high than when it is low.

Team creativity and team financial performance

Despite the increasing attention to creativity, research has focused mostly on the antecedents of creativity rather than its consequences (Shalley et al., 2004). For this reason, evidence of the positive effects of creativity on performance is relatively scarce, particularly at the team level. The few empirical studies on the team-level relationship between creativity and performance have been conducted mostly using cross-sectional designs with subjective performance measures (Nilniyom, 2007; Sarin & McDermott, 2003). In our study, we investigated the effects of team creativity on team financial performance over a period of 6 months. It is important to learn whether creative teams actually exhibit better financial performance than teams that rely on common sense and conventional wisdom.

Hypothesis 6. Team creativity is positively related to team financial performance.

Team creativity as a mediating process

Our analysis so far suggests that team creativity is a meaningful venue through which TKM promotes team financial performance. Existing studies of team knowledge have focused on the effects on such outcomes as team effectiveness and efficiency (Martin & Parboteeah, 2007), goal attainment (Austin, 2003), and customer satisfaction (Griffith & Sawyer, 2010). Although these studies presumed that team creativity is the underlying mechanism that accounts for the effects of team knowledge on team performance, such presumption has not been tested. By contrast, when team creativity is the outcome of a study, researchers have rarely included other team outcomes, assuming the performance benefit of creativity (Shalley et al., 2004). Addressing these shortcomings of the TKM and creativity literature, we consider team creativity as a process instead of an outcome in itself, which accounts for the effect of TKM on a team's objective performance (Gilson, 2008).

Efforts by a team to expand its knowledge base and to utilize fully its knowledge may boost team performance over time because such knowledge management activities enable the team to identify novel approaches, procedures, and services to fulfill customer demands better (Griffith & Sawyer, 2010). The implication of TKM for team performance may be limited unless it contributes to intermediate team processes that engender more innovative alternatives and creative solutions, which should be more directly responsible for performance gains (De Dreu & West, 2001; Tiwana & McLean, 2005). Thus, team creativity is a plausible, intermediate process through which TKM can improve team performance over time.

Hypothesis 7. Team creativity mediates the relationship between TKM and team financial performance.

Method

Research setting and data collection

Our sample was drawn from a large Korean insurance company. Although creativity is typically associated with engineers, scientists, and artists, it is not bound to a particular domain (Mumford, Whetzel, & Reiter-Palmon, 1997). Rather, creativity is relevant to a wide variety of occupations and organizations, including sales and marketing groups (Redmond, Mumford, & Teach, 1993). Recently, Gong et al. (2009) conducted focus group interviews with insurance agents and found that their tasks, which include identifying solutions to the tax or financial problems of their clients, developing customized insurance products, and devising and implementing marketing strategies, required much creativity.

We collected data using four different survey instruments designed for four distinct groups of respondents from each branch: branch managers, team leaders, and two separate subgroups of financial planners within the same team (Subgroups 1 and 2). The survey instruments were designed in collaboration with human resource managers at the corporate headquarters. Data collection was conducted as part of a company-wide organizational diagnosis that involved the entire sales branch population. Over a period of two weeks, data were collected from 1150 participants across 81 branches (response rate = 53.8%).

To test our hypotheses, we utilized teams that had usable data from all four respondent groups. This screening procedure resulted in a final sample of 307 individuals in 65 sales teams across 35 branches. Similar to the typical structure of sales branches in this company, each branch included two sales teams (on average). The participants included 35 branch managers, 65 team leaders, and 207 team members (3.2 members per team). Each sales team in the final sample had an average of 5.9 members (SD = 1.89, ranging between 4 and 11 members). Fifty-nine percent of the financial planners were men. Their mean age was 39.6 years (SD = 7.60), and their mean organizational tenure was 4.5 years (SD = 5.07). The demographic profile of this sample was comparable to that of the entire population in terms of gender, age, and tenure (F tests, all $p > .50$), indicating that sampling bias did not affect the results.

Measures

Team members reported on the knowledge stock and knowledge utilization of their teams. Team leaders rated knowledge stock, cognitive styles, and team creativity. Branch managers rated environmental uncertainty. Team financial performance was operationalized as the rate of change in team financial performance over the 6-month period following the survey. Study variables were assessed using multi-item scales with acceptable levels of: (a) internal consistency of scale items, (b) within-group agreement among team members ($r_{wg(j)}$), and (c) intraclass correlations that reflected between-group variations in individual ratings (ICC(1) and ICC(2), Chen, Mathieu, & Bliese, 2004). The response format for all of the scale items was a 6-point (1–6) Likert scale, with options ranging from *strongly disagree* to *strongly agree*.

Team knowledge stock (members of Subgroup 1 and team leaders)

Consistent with previous studies (Austin, 2003; Cruz et al., 2007; Mathieu & Schulze, 2006), team knowledge stock was operationalized as the combination of knowledge possessed by team members and leaders. Specifically, we followed the scale development procedure used by Austin (2003), in which the knowledge stock of 27 strategic management teams in an apparel and sporting goods company was assessed. To identify the core set of knowledge required for the current task domain, we conducted a preliminary survey with a sample of three team leaders and 47 financial planners. We asked them to list knowledge and skills important for high performance by financial planners. By analyzing the content of their responses, we identified five areas of knowledge and skills that reflect the current task area, which were then transformed into the following measurement items: "I have adequate levels of: (a) expertise on insurance and finance-related matters, (b) communication and negotiation skills, (c) know-how and knowledge on customer management, (d) skills related to computer programs and the company information system, and (e) knowledge on insurance products and other financial services." Both members and leaders reported the extent to which they possessed these task-related knowledge and skills. The scale showed a sufficient level of internal consistency (α = .88), along with acceptable levels of group-level agreement and between-group variations ($r_{wg(5)}$ = .86, ICC(1) = .38, ICC(2) = .50, F = 2.01, $p < .01$), justifying the aggregation of knowledge held by members and leaders at the group level.

Team knowledge utilization (members of Subgroup 2)

Drawing on existing measures (Akgün et al., 2008), we constructed a three-item scale (α = .92, $r_{wg(3)}$ = .87, ICC(1) = .40, ICC(2) = .52, F = 2.09, $p < .01$) to assess team knowledge utilization: (a) "Team members' task-related expertise and skills are fully utilized in our team's activities," (b) "Various knowledge and skills of our team members promote learning in our team," and (c) "Team members' knowledge and skills are effectively utilized in solving problems we encounter."

Intuitive cognitive style (team leaders)

Adopting items from previous studies (Jabri, 1991; Monnavarrian, 2002), we used a three-item measure (α = .78) to assess the intuitive problem-solving style of team leaders: (a) "I look at things from a number of different perspectives and connect various

thoughts in doing my job," (b) "I try to find new ways to solve existing problems," and (c) "When facing problems, I consider a broad range of perspectives and possibilities."

Systematic cognitive style (team leaders)

We used a four-item scale ($\alpha = .85$) drawn from prior studies (Jabri, 1991; Monnavarrian, 2002) to assess the systematic problem-solving style of team leaders. The scale included the following items: (a) "I follow commonly accepted rules in performing my task," (b) "I tend to adhere to systematic procedures related to my job," (c) "I prefer to work without deviating from the prescribed methods or task procedures," and (d) "I have a tendency to apply standardized procedures in solving problems."

Environmental uncertainty (branch managers)

A four-item scale ($\alpha = .78$) developed by Waldman, Ramirez, House, and Puranam (2001) was modified to measure environmental uncertainty as perceived by branch managers: (a) "The insurance market is changing rapidly," (b) "We may fall into a dangerous situation unless we deal with the threat from the environment properly," (c) "There is fierce competition among financial industries and companies," and (d) "The market environment surrounding our business is highly uncertain." In the present context, each branch included two sales teams. These were parallel and structurally equivalent functional units that performed practically identical tasks within the same business environment in the same geographical region and with the same customer groups. Thus, branch-level environmental uncertainty was the operating context for both teams.

Team creativity (team leaders)

In accordance with existing studies (Akgün et al., 2008; De Dreu & West, 2001; Pirola-Merlo & Mann, 2004), team creativity was reported by team leaders who were viewed as reliable sources of team information. Consistent with previous studies on team creativity (Gilson & Shalley, 2004; Tu, 2009), we adapted the following three items ($\alpha = .94$) from Zhou and George's (2001) measure of individual creativity to the team level: (a) "Our team comes up with new and practical ideas in solving problems," (b) "Our team easily develops new ways and procedures related to the task," and (c) "Confronting problems, our team generates creative solutions."

Team financial performance (company records)

Team performance was assessed using the actual financial outcomes of participating sales teams, as found in financial data offered by the company. As is typical in the incentive schemes of insurance companies, team sales performance was linearly and almost perfectly related to financial remunerations. Thus, we operationalized team financial performance as the *rate of change* in the total amount of financial remunerations offered to teams (including the leader and members) over the 6-month period following the survey data collection. Specifically, this measure was computed by using the following formula: [(total financial remunerations offered in the fifth and the sixth months) − (total financial remunerations offered in the first and the second months)]/(total financial remunerations offered in the first and the second months). For example, if a sales team received a total of US$50,000 in the first 2 months and a total of US$75,000 in the last two months within the 6-month duration, the rate of change of this team is .50 ([75,000 − 50,000]/50,000). This rate of change in the current sample of 65 sales teams ranged between −.62 and 3.48 with a mean of .53. We utilized the change rate in team financial performance over time, instead of the absolute amount at a specific point in time, because the absolute volume of team sales may be affected by a number of extraneous factors, such as the geographical region of a branch, the structure of client bases, local economic situations, and performance history. Thus, the rate of change in sales performance offers a relatively comparable indicator of team performance over time, one that controls for extraneous factors.

Results

Although we used multi-source data and objective measures of team performance, the predictors were all collected at the same time and were based on psychometric scales rated by team members and managers. To test the empirical distinctiveness of the measures, we factor-analyzed the eight items that comprised the two TKM scales rated by members, and the 11 items that comprised the three scales for cognitive styles and team creativity rated by leaders. A two-factor model of the TKM scales exhibited good fit with the data (χ^2 ($df = 16$) = 25.40, $p = .063$; CFI = .97; RMR = .059) and performed better than the alternative single-factor model ($p < .001$). A three-factor model for the cognitive styles of leaders and team creativity also showed a good fit (χ^2 ($df = 28$) = 33.10, $p = .232$; CFI = .98; RMR = .078) and provided a significantly better fit to the data than the alternative two-factor and single-factor models (all $p < .001$). Overall, these confirmatory factor analysis results demonstrated the empirical distinctiveness of the scales used. Table 1 shows the descriptive statistics and correlation coefficients for all study variables.

Hypothesis testing

Our data had a nested structure, with multiple teams embedded in branches. Considering that structure, we conducted a multivariate hierarchical linear modeling of the data (HLM; Bryk & Raudenbush, 1992). Specifically, we conducted HLM analyses in a stepwise manner, under which several clusters of independent variables were entered sequentially into multilevel equations predicting team creativity and financial performance. For each HLM model, team-level and branch-level variances were also reported; these were then used to calculate the amount of explained variance (equivalent to R^2). We also tested the possibility that the age, gender, and tenure of team members affected TKM, team creativity, and financial performance. However, none of these variables was significantly related to those outcomes, and so we did not include them as control variables in our HLM models.

Main effects of TKM

In Hypotheses 1 and 2, we posited that team knowledge stock and knowledge utilization enhance team creativity. These two TKM dimensions were entered to the equation in Model 1 (Table 2). Of the two dimensions, only team knowledge utilization was significantly related to team creativity ($\beta = .26$, $p < .05$), confirming Hypothesis 2. In contrast, team knowledge stock was not a significant predictor of team creativity, disconfirming Hypothesis 1.

Moderating effects of the cognitive styles of leaders

In Hypotheses 3 and 4, we proposed that the cognitive styles of team leaders moderate the relationship between TKM and creativity. The two cognitive styles, as reported by team leaders, were highly correlated. Thus, we tested the moderating effects of the intuitive style (Model 2) and the systematic style (Model 3) separately. Moreover, we simultaneously entered both cognitive styles into the equation (Model 4).

First, as predicted in Hypothesis 3, team knowledge stock and the intuitive cognitive style of leaders had a significant positive interaction ($\beta = .47$, $p < .01$). To clarify this interaction, we conducted a simple slope analysis (Aiken & West, 1991). The two regression lines shown in Fig. 1 confirmed that the stock of knowledge and skills available to the team contributed to team creativity

Table 1
Means, standard deviations, and correlations among study variables.

Variables	*M*	*SD*	1	2	3	4	5	6	7
1. Team knowledge stock (Subgroup A and team leaders)	4.13	.75	–						
2. Team knowledge utilization (Subgroup B)	4.27	1.17	.13	–					
3. Leader intuitive style (team leaders)	4.54	.92	.37**	.19	–				
4. Leader systematic style (team leaders)	4.50	.89	.43**	.14	.61**	–			
5. Environmental uncertainty (branch managers)	5.17	.67	.08	−.03	.20	.22	–		
6. Team creativity (team leaders)	3.82	1.15	.28*	.30*	.31*	.30*	-.04	–	
7. Team financial performance (company record)	.53	.77	.16	.07	.05	.15*	.10	.24**	–

Note: Unit of analysis is the team ($N = 65$).
* $p < .05$.
** $p < .01$.

Table 2
Hierarchical linear models predicting team creativity.

Variables	Null model	Model 1	Model 2	Model 3	Model 4	Model 5
Team knowledge stock (TKStock)		.40	.45**	.36*	.30	.42*
Team knowledge utilization (TKUtil)		.26*	.29*	.24*	.22*	.10
Leader intuitive style (IntuiStyl)			.33		.28	.19
Leader systematic style (SysStyl)				.36**	.24	.31
TKStock * IntuiStyl			.47**		.14	.16
TKStock * SysStyl				.40***	.35	.30
TKUtil * IntuiStyl			.11		−.10	.05
TKUtil * SysStyl				.32**	.39*	.40*
Environmental uncertainty (EnvUnc)						−.30*
EnvUnc * TKStock						−.47
EnvUnc * TKUtil						.43*
Group-level variance, δ^2	1.3317	1.1688	1.0450	0.9246	0.9523	0.9301
Change in variance, $\Delta\delta^2$		0.1629	0.1238	0.2442	0.1645	0.0222
Proportion of explained variance (%)		12.23	10.59	20.89	14.73	2.33
Branch-level variance, τ	0.0012	0.0007	0.0019	0.0008	0.0009	0.0005
Change in variance, $\Delta\tau$		0.0005	n.a	n.a	n.a	0.0004
Proportion of explained variance		41.67%	n.a	n.a	n.a	44.44%

* $p < .05$.
** $p < .01$.
*** $p < .001$.

($\beta = .83$, $p < .001$), when the intuitive cognitive style of leaders was strong (one SD above the mean), but did not contribute to team creativity ($\beta = -.09$, *ns*) when that style was weak (one SD below the mean).

Second, when Model 3 was tested (Table 2), the systematic cognitive style of leaders was significantly and positively related to team creativity ($\beta = .36$, $p < .01$). Furthermore, and somewhat unexpectedly, this style had significant and positive interactions with knowledge stock and knowledge utilization in predicting team creativity ($\beta = .40$, $p < .001$ and $\beta = .32$, $p < .01$, respectively). These interactions were explored in the same manner described earlier. As shown in Fig. 2, team knowledge stock was a significant positive predictor of team creativity when the systematic cognitive style of leaders was strong ($\beta = .93$, $p < .001$), but not when it was weak ($\beta = -.20$, *ns*). A similar pattern was observed for the interaction between the systematic cognitive style of leaders and team knowledge utilization; the relationship between team knowledge utilization and team creativity was positive and significant when the systematic cognitive style of leaders was strong ($\beta = .72$, $p < .001$), but not when it was weak ($\beta = -.20$, *ns*).

Moderating effects of environmental uncertainty

In Hypothesis 5, we suggested that the relationship between TKM and team creativity is moderated by environmental

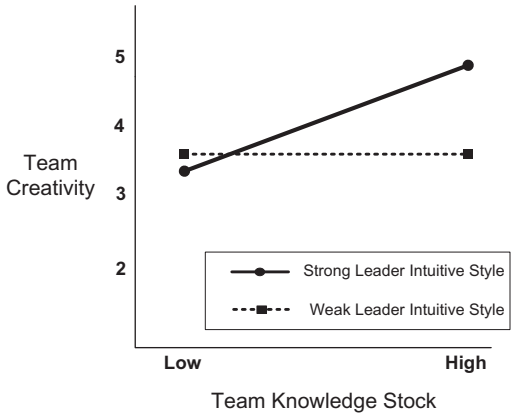

Fig. 1. Interaction between team knowledge stock and the intuitive style of leaders in predicting team creativity.

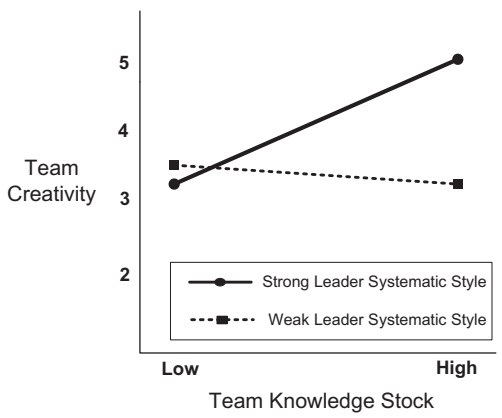

Fig. 2. Interaction between team knowledge stock and the systematic style of leaders in predicting team creativity.

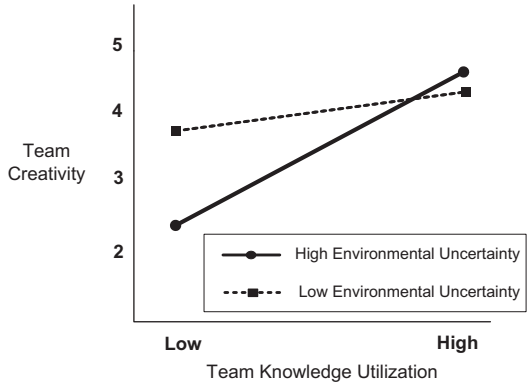

Fig. 3. Interaction between team knowledge utilization and environmental uncertainty in predicting team creativity.

uncertainty. We tested the cross-level moderating effect of environmental uncertainty by introducing its main effect and its interaction terms with the two TKM dimensions in Model 5 (Table 2). Branch-level environmental uncertainty had a significant negative main effect on team creativity ($\gamma = -.30$, $p < .05$), but it also had a significant and positive interaction with knowledge utilization ($\gamma = .43$, $p < .05$), supporting Hypothesis 5. To explore this cross-level interaction, we conducted separate regression analyses for two subgroups composed of high (one *SD* above the mean) and low (one SD below the mean) levels of environmental uncertainty. As shown in Fig. 3, the effect of knowledge utilization on team creativity was more positive for teams operating under high uncertainty ($\beta = .46$, $p < .10$) than it was for teams operating under low uncertainty ($\beta = .01$, *ns*).

Team creativity and financial performance

In Hypothesis 6, we predicted a positive relationship between team creativity and team financial performance. We tested this hypothesis using the HLM procedure and found that team creativity was indeed a significant predictor of team financial performance over the 6-month period ($\beta = .16$, $p < .05$).

Hypothesis 7 suggested that team creativity mediates the effects of TKM on team financial performance. However, we found that neither team knowledge stock nor team knowledge utilization was significantly related to financial performance ($\beta = .14$ and .02, respectively, both *ns*), so Hypothesis 7 was disconfirmed (Baron & Kenny, 1986). Although the main effect of TKM on financial performance was not significant, our analysis indicated that the interaction between team knowledge utilization and the systematic cognitive style of leaders was a significant predictor of financial performance ($\beta = .27$, $p < .05$). We tested the significance of the mediating role of team creativity using the bootstrapping procedure, which is an increasingly popular approach that avoids the problems prompted by asymmetric and non-normal sampling distributions that often characterize mediated relationships (MacKinnon, Fairchild, & Fritz, 2007). The interaction between team knowledge utilization and the systematic cognitive style of leaders had a marginally significant, indirect effect on financial performance through team creativity ($p < .10$). These patterns suggest that the TKM–financial performance relationship is contingent upon the leader and/or other team contextual factors.

Discussion

The present study examined the effects of TKM on creativity, as well as the moderating effects of the cognitive styles of leaders and environmental uncertainty on the TKM–creativity relationship. Of the two dimensions of TKM, only team knowledge utilization was a significant predictor of team creativity. Although team knowledge stock did not show a main effect, it was positively related to team creativity when leaders had either a high intuitive or a high systematic cognitive style. The positive relationship between team knowledge utilization and team creativity was stronger when the team leader had a high systematic cognitive style and when the teams were exposed to high environmental uncertainty. Furthermore, by demonstrating that team creativity improves team financial performance over the span of 6 months, the present study highlights the significance of team-level creativity as a critical team outcome that contributes to organizational performance. Our analysis supported the overall theoretical framework, although some unexpected patterns involving the systematic cognitive style of leaders were observed. We discuss the implications of the current study and its limitations that warrant future research below.

Implications for theory and research

Of the two TKM dimensions, only team knowledge utilization showed the hypothesized main effect on team creativity. Previous studies have already recognized and demonstrated the importance of domain-relevant skills on individual creativity (Amabile, 1996; Choi et al., 2009). Individuals may not have any difficulty applying their knowledge to generate novel solutions when they possess a wide array of knowledge and information. At the team level, however, the mere possession of knowledge by team members may be insufficient if their knowledge is not shared, thereby failing to influence collective problem-solving processes (Griffith & Sawyer, 2010). The insignificant correlation coefficient between team knowledge stock and team knowledge utilization ($r = .14$, *ns*) indicates that the team-level dynamics involving the content and process dimensions of knowledge management are distinct from each other.

Gino et al. (2010) report that the task-related experiences of team members promote team creativity through the collective awareness of "who knows what" that promotes the utilization of knowledge held by members. Active engagement in mutual learning and information sharing fosters high-order forms of thinking, enabling group members to develop new cognitive schemas and frame issues innovatively (Choi, 2006; McKeachie, 1999). The team knowledge literature has mostly adopted a process (instead of content) perspective toward TKM, effectively endorsing the importance of what teams do with their knowledge, instead of what they know (Gino et al., 2009, 2010; Liang et al., 1995; Moreland, 1999; Moreland & Myaskovsky, 2000). Notably, our analysis indicates that team knowledge stock becomes a meaningful predictor of team creativity with the help of intuitive and systematic leaders (Table 2). Thus, in contrast to the more general, prevailing effect of knowledge utilization in teams, the effect of team knowledge stock may be contingent upon contextual and interpersonal processes and states, such as participative leadership, trust, and a learning climate in teams (Hülsheger et al., 2009).

Contrary to our expectations, team creativity was enhanced by a systematic cognitive style among leaders. Although the two cognitive styles seem to complement each other as indicated by a significant positive interaction between them in predicting team creativity ($\beta = .27$, $p < .05$), a systematic cognitive style indeed exerted significant main and interaction effects by itself. In interpreting these somewhat unexpected results, we offer several possibilities that suggest intriguing directions for future research. First, to promote team creativity, leaders may need to keep the goal clear to the entire team, and to systematically organize and manage problem-solving processes (Cohen & Levinthal, 1990). Considering the managerial function assigned to leaders, they have to

play roles different from their followers to achieve creative performance at the team level. Intuitive members may maximize their creative contributions under the supervision of systematic leaders who introduce order to chaotic and disorganized creative processes.

Second, the present research setting can also explain the positive effect of the systematic cognitive style of leaders. In an R&D setting, creativity among engineers is negatively related to a systematic style (Scott & Bruce, 1995). In contrast, financial institutions tend to be cautious because of environmental risks and stringent public regulations (Rueda-Manzanares et al., 2008). The teams included in our analysis operated within these constraints, which likely limited options for problem solving because creative efforts were bound by rules and regulations related to financial services. Such a situation may make a systematic cognitive style more appropriate and effective for generating creative solutions.

Third, the nature of the task may demand distinct types of creativity, thus imposing different creative requirements (Unsworth, 2001). The positive role of the systematic cognitive style in creativity recently has been acknowledged by Sagiv et al. (2010). They reported that in highly structured situations, which allow individuals to focus on clearly defined sets of core elements to solve problems, people with a systematic style produce more creative ideas than those with an intuitive style. Assuming that the novelty and usefulness dimensions of creativity are driven by different kinds of problem-solving efforts (Amabile, 1996), one plausible set of hypotheses is that: (a) team knowledge stock and a systematic cognitive style are apt to produce feasible or practical solutions or incremental innovations, whereas (b) team knowledge utilization and an intuitive cognitive style may generate novel solutions or radical innovations (cf. Madjar, Greenberg, & Chen, 2011). Future research should focus on the more specific dynamics of the different aspects of TKM and cognitive styles of leaders.

Another interesting finding was the negative cross-level main effect of environmental uncertainty on team creativity. This pattern reflects a dilemma for organizational teams. Teams appear to perform more creatively when the situation is predictable than when the situation is uncertain and ambiguous. In the latter kind of situation, problems are less clear and solutions are disorganized (Sagiv et al., 2010). So, in a sense, teams tend to be less creative when they need to be more creative. Given the likely connection between environmental uncertainty and external threats, teams may fall victims to the well-known, threat-rigidity phenomenon (Staw, Sandelands, & Dutton, 1981), and thus fail to initiate novel reactions when faced with threatening, uncertain environments that demand greater levels of creativity.

As expected, however, environmental uncertainty had a positive moderating effect on the relationship between knowledge utilization and team creativity. This finding supports the argument that under high environmental uncertainty, the effective employment of available knowledge and skills is more important for teams to successfully adapt to changing environmental demands (Mathieu et al., 2000). In highly uncertain situations, teams face a greater need for selecting, experientially refining, and reconfiguring their knowledge and existing routines (Aragón-Correa & Sharma, 2003). In contrast, a relatively stable and predictable business environment does not require the complex manipulation and extensive application of knowledge and skills, thus diluting the positive effect of knowledge utilization on team creativity.

Study limitations and conclusion

Our results should be interpreted with caution, considering the several limitations of our study. First, except for the financial performance measure, all study variables were collected at the same time. Although we used four different data sources (branch managers, team leaders, and members in two subgroups within the same team), members of the same group may possibly share informal and intuitive cognitions about the relationships among variables, and these cognitions may have affected their responses (Martell, Guzzo, & Willis, 1995). To avoid such bias, future studies should use independent data sources (along with objective indicators) and longitudinal data to assess team creativity.

Second, similar to previous researchers (e.g., Austin, 2003; Cruz et al., 2007; Mathieu & Schulze, 2006), we employed a bottom-up formation strategy to measure team knowledge stock by averaging the knowledge stock held by leaders and members. Although psychometric properties (e.g., r_{wg}, ICC) of the scale have justified our procedure, there might be alternative ways that offer a valid operationalization of the team knowledge stock construct (Chen et al., 2004). Future research could measure team knowledge stock using alternative approaches, such as a global assessment reported by external experts or corporate records of competence or skill levels of members (Chan, 1998).

Finally, our research context (a financial institution in Korea) could have affected our findings. Specifically, fierce competition in the Korean financial industry could have increased the focus of branch managers on environmental uncertainty. Despite this competition, however, Korean financial institutions are still exposed to consistent regulations. Hence, employees in this sector are less willing to take risks than are employees in other sectors, such as the electronics industry (Morgan & Sturdy, 2000). In addition, Korean culture is characterized by a tendency toward uncertainty avoidance and collectivism, which results in such managerial practices as promotion based on seniority and an emphasis on employee conformity (Kee, 2008). These cultural and managerial factors can promote more rule-based operations instead of risk taking, which could make systematic leaders more effective than intuitive leaders at managing creative efforts by teams. Future research should validate the current framework in other industrial and cultural contexts.

Despite these limitations, the present study makes meaningful contributions by theorizing and empirically validating the relationships among TKM, team creativity, and financial performance. Our results indicated that the mere possession of domain-relevant knowledge is not enough for teams to become creative. Instead, to gain creative benefits, team members must actively apply and utilize their knowledge. We further demonstrated that the value of knowledge utilization in team creativity increases when the team leader has a systematic cognitive style and when the team is operating under high environmental uncertainty. Our findings also suggest the need to further investigate the roles of intuitive and systematic cognitive styles held by members and leaders in predicting various forms of creative performance involving different types of work tasks. Future studies could elaborate on team learning mechanisms (e.g., SMM and TMS) that boost team knowledge utilization, and information processing mechanisms that emphasize the effects of the different TKM aspects on team creativity. Researchers should also identify affective processes in teams, such as psychological safety, group moods, and group cohesion, which may work (separately or together) with cognitive team processes to produce collective creative outcomes.

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