2017

The Team Creativity Model: An Exploratory Case Study

Triparna de Vreede

University of South Florida, tdevreede@usf.edu

Imed Boughzala

Institut Telecom Sud Paris, imed.boughzala@it-sudparis.eu

Gert-Jan de Vreede

University of South Florida, gdevreede@usf.edu

Roni Reiter-Palmon

University of Nebraska at Omaha, rreiter-palmon@unomaha.edu

Follow this and additional works at: <http://aisel.aisnet.org/jmwais>

Recommended Citation

de Vreede, Triparna; Boughzala, Imed; de Vreede, Gert-Jan; and Reiter-Palmon, Roni (2017) "The Team Creativity Model: An Exploratory Case Study," *Journal of the Midwest Association for Information Systems (JMW AIS)*: Vol. 2017 : Iss. 1 , Article 4. Available at: <http://aisel.aisnet.org/jmwais/vol2017/iss1/4>

This material is brought to you by the Journals at AIS Electronic Library (AISeL). It has been accepted for inclusion in Journal of the Midwest Association for Information Systems (JMW AIS) by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact elibrary@aisnet.org.

Date: 01-31-2017

The Team Creativity Model: An Exploratory Case Study

Triparna de Vreede

University of South Florida, tdevreede@usf.edu

Imed Boughzala

Institut Mines-Telecom, France, imed.boughzala@it-sudparis.eu

Gert-Jan de Vreede

University of South Florida, gdevreede@usf.edu

Roni Reiter-Palmon

University of Nebraska at Omaha, rreiter-palmon@unomaha.edu

Abstract

Organizations increasingly rely on technology-supported teams to solve problems creatively or design new products and services. To support such efforts, an extensive body of research on creativity has been developed. However, most research to date focuses on individual creativity, rather than on team creativity. This paper introduces the Team Creativity Model (TCM) to understand the antecedents of team creativity. TCM posits that both individual creativity and shared mental models (SSMs) contribute to team creativity. SSMs act as a mediator between knowledge sharing and team creativity. Antecedents to individual creativity include an individual's propensity to be creative and individual knowledge. Individual knowledge also is an antecedent to knowledge sharing, as are an individual's propensity to share knowledge and trust within the team. In an exploratory study at a telecom company, a team of design experts participating in four creative sessions provided initial support for the TCM constructs and their relationships. The findings suggest that further exploratory and empirical research on TCM is justified. Implications for research and practice are presented.

Keywords: Creativity, team creativity, collaboration technology, collaboration

Copyright © 2017 by Triparna de Vreede, Imed Boughzala, GJ de Vreede, Roni Reiter-Palmon

1. Introduction

Organizations face problems today that are too complex for one individual or a mono-disciplinary team to solve (Kozlowski & Bell, 2008). The quality of team collaboration in an organization directly affects the organization's outcomes and performance (Jordan, Ashkanasy, Härtel, & Hooper, 2002), especially when tasks are complex, ambiguous, and dynamic (Burke, Stagl, Salas, Pierce, & Kendall, 2006). Therefore, organizations are increasingly relying on the use of teams to accomplish their goals (Gardner, 1988). For instance, in 1999 it was reported that slightly less than 50% of organizations used teams (Devine, Clayton, Phillips, Dunford, & Melner, 1999). However, the trend started to change in the new millennium when the reports suggested that usage of teams in organizations have jumped to over 70% of companies in 2003, and 80% in 2004 (Edmondson & Roloff, 2009). In the past decade, this trend got a further boost through the increased globalization and interdependencies between teams across nations (Carter & Greer, 2013). These changing business models changed the focus from merely management of people to leading teams and reassigning of responsibilities that the team members have (Groves, 2014).

To support teams and increase the quality of teamwork, many collaboration technology solutions have been developed to enable teams to work together more productively. These technological advances have enabled organizations to have a global reach. Geographically dispersed locations and multi-disciplinary distributed teams have become realistic and preferred work arrangements for many modern organizations. Some studies have found that under certain conditions, teams can experience productivity improvements of over 50% (Briggs, de Vreede, & Nunamaker, 2003). Other studies report challenges that technology-supported teams experience, such as poor adoption, suboptimal process support, and working across time and space (e.g. Agres, de Vreede, & Briggs, 2005; Anson & Munkvold, 2004). However, there have not been many studies that looked at the team creativity process for technological innovations.

Accordingly, in this paper, we specifically focus on technological teams that have to solve problems creatively. Creativity is quickly becoming an essential part of non-routine project teams who are tasked with the development of new and innovative products or services (Leenders, van Engelen, & Kratzer, 2003). Today's high levels of market competition, rapid technology developments and short product life spans set increasingly challenging requirements to create new product specifications. Team members have to display high levels of creativity in order to remain ahead of the curve (Leenders et al., 2003). Therefore, organizations are creating project based teams which consist of individuals tasked with generating innovative ideas and then transferring these ideas to create marketable technology, products, and services (Iansiti & West, 1997; Thamhain, 2003). Team collaboration is especially important at the early stages of the creative process (Hoegl, Weinkauff, & Gemuenden, 2004). Research on the relationship between team collaboration, team creativity, and innovation has shown that having team goals emphasizing collaboration produces more new ideas and results in an improvement of team innovation (Mitchell, Boyle, & Nicholas, 2009; Pearce & Ensley, 2004).

Despite the increasing relevance of team creativity, this area has not been extensively researched (Gong, Kim, Lee, & Zhu, 2013). Most of the early work on organizational creativity has focused on the individual level. Teams were viewed as a social context within which individuals function and which could facilitate or inhibit individual creativity (Amabile, 1996; Woodman, Sawyer, & Griffin, 1993). However, there are several reasons why organizations should specifically focus on the role of teams in the development of creative products. First, models have been developed that suggest some team properties can be emergent (Kozlowski & Klein, 2000). Emergence can be defined as a phenomenon that "originates in the cognition, affect, behaviors, or other characteristics of individuals, is amplified by their interactions, and manifests as a higher-level, collective phenomenon" (Kozlowski & Klein, 2000, p. 55). This definition suggests that team creativity might be an entirely different process than individual creativity and should not merely be viewed as a background or a social process. Second, a focus on team creativity enables teams to capitalize on the social interactions of the team members (Tesluk, Farr, & Klein, 1997). Project teams, such as agile development teams or teams working in IT outsourcing arrangements, represent complex social systems that may involve multiple stakeholders from different parts of the organization. One of the critical aspects of innovation is the integration of existing knowledge and ideas into an innovative business model. Studying creativity at the team level allows organizations to better understand the social interactions and allows them to exploit and integrate the expertise of the team members in order to generate more creative ideas. Third, encouraging team creativity enables team members to share their thoughts and ideas, thereby leading to a shared understanding of the product, market, and customer requirements (Gardner, 1988). Also, teamwork creates opportunities for team members to participate in group decision making and problem solving which in turn allows team members to utilize their varied skill sets and experiences (King & Anderson, 1990). Finally, a deeper understanding of team creativity will assist IT professionals to better develop and configure technology support for creative teamwork.

One of the aspects of team creativity that requires attention concerns the antecedents of team creativity. While it is being accepted that team creativity is beneficial for organizations, there have not been many studies that isolate the factors that encourage or inhibit team creative outputs. It is important to understand the antecedents of team creativity, as it will help organizations to create an environment and select team members that maximize the chances of innovation. Without a clear understanding of the factors affecting creativity, organizations cannot effectively utilize the expertise of their teams.

Therefore, the purpose of this paper is to explore and understand the antecedents of team creativity. The remainder of the paper is structured as follows. In the next section we introduce the Team Creativity Model (TCM), a theoretical model of the antecedents of team creativity. This is followed by the details of an exploratory case study in which we evaluate the TCM by analyzing the session transcripts and providing examples that provide support for the TCM constructs and their relationships. Through this case study we compare the constructs and relationships proposed by the TCM with the attitudes, opinions, and reported actions of a team of experts from different areas involved in four creativity sessions within an International Telecom company to come up with a new and innovative cellular phone model. The paper concludes with a discussion of some tentative implications based on the model's logic, the study's limitations, and directions for future research.

2. A Model of Team Creativity

Creativity is often defined in terms of novelty and usefulness. A well-accepted definition of creativity is “a product or response that is (a) both a novel and appropriate, useful, correct or valuable response to the task at hand, and (b) the task is heuristic rather than algorithmic in nature” (Amabile, 1983). There appears to be consensus among researchers that when individuals work together to solve problems creatively, the creativity of the team as a whole will be influenced by the creativity of the individuals that make up the team (Tiwana & McLean, 2005; Pirola-Merlo, Hartel, Mann, & Hirst, 2002). However, the extent of this influence is debated. Some researchers argue that team creativity can simply be considered as the combined creativity of the individual team members (Pirola-Merlo et al., 2002). Other researchers posit that the collaboration between the team members may lead to higher levels of team creativity than can be explained by the combined individual creativity levels: Combining contributions from the individual team members may lead to richer, more creative ideas at the team level (Tagger, 2002). Yet, team creativity does not result from merely combining individual's creative ideas. Team creativity is a synergetic progression that occurs during a social process of sense-making and collaboration where one individual's actions may inspire the team to devise and follow a more creative process to address the problem at hand resulting in higher levels of creativity (Tagger, 2002; Tiwana & McLean, 2005; Weick, 2012). The Team Creativity Model (TCM) that we introduce below adopts the second perspective, i.e. that team creativity is more than just the combined creativity of the individual team members.

Following Amabile's (1983) definition of individual creativity, we define team creativity as the extent to which a team's ideas in response to a problem-solving task are both novel and useful. TCM posits that team creativity is directly influenced by individual creativity. The extent to which individual members of a team are capable of generating creative ideas will determine the creativity of the team as a whole since the individual contributions provide the team with its 'raw' materials (see e.g. Gong et al., 2013; Santanen, Briggs, & de Vreede, 2004). Furthermore, creative individuals, experts in particular, are less likely to have difficulties or be uncomfortable expressing themselves, even under less than optimal conditions (Collaros & Anderson, 1969). Thus, if teams have a higher proportion of creative individuals who are experts, such teams will be more likely to have a higher degree of team creativity. However, it is important that the members of the creative team are channeled to express themselves properly and process loss is limited during their discussions as this may result in sub-optimal conditions for individual team members to express themselves (Kerr & Tindale, 2004).

An individual's propensity to be creative is an important determinant for individual creativity. Research shows that aspects of individual ability, personality, motivational variables, and certain cognitive processes are strongly associated with individual creativity (George, 2007; Hennessey & Amabile, 2010; Mumford, Mobley, Uhlman, Reiter-Palmon, & Doares, 1991). As early as the 50s, research showed that people who were more creative were also rated by their peers to be more sociable and popular than their non-creative counterparts (Rivlin, 1959).

Along with personality and social variables that enable groups to be creative, skill sets that encourage creativity also add to the creative propensity of the individual. Amabile (1983) identified creativity relevant skills to include skills to break the most commonly used perceptual concepts and be able to abandon the most commonly used strategies and move in new directions. People who could look at problems with a new strategy and approached the problem with a blank canvas were better able to get creative (Getzels & Csikszentmihalyi, 1976). Another characteristic that enabled individuals to be creative was the capability to

suspend judgment and use wide categories while coming up with creative ideas (Cropley, 1967; Stein, 1965). Finally, individuals who remembered large amounts of information more accurately also had the capability to be more creative than their counterparts (Campbell, 1960).

Creativity is also influenced by an individual's knowledge in his/her own discipline. Expertise and domain knowledge have been found to be important contributors to creativity (Ericsson, 1999; Vincent, Decker, & Mumford, 2002). Complete novices tend to be less creative at first but as they gain knowledge, their creativity increases rapidly (Stacey, Eckert, & Wiley, 2002). However, research shows that the relationship between expertise and creativity is curvilinear (Zimmer, Tams, Craig, Thatcher, & Pak, 2015). That is, to a certain point, as expertise increases, so does the individual creativity. Yet increased expertise at some level tends to close people off to options that are beyond their area of expertise and they start to depend on a broad array of conservative options that have been successful in the past (Stacey et al., 2002).

Individual knowledge not only influences individual creativity, but also affects the amount of knowledge sharing that takes place in a team. Knowledge sharing occurs when group members voluntarily exchange information with the purpose of reaching a broader understanding of their group goal and its accomplishment (Gigone & Hastie, 1993). Knowledge sharing is critical for creative teams. The type of knowledge that is most likely to be important for creative teams is the one that is unique to each team member based on his/her area of expertise. Groups that are able to consider more information from diverse sources are more likely to arrive at better solutions than individuals working on their own (Gigone & Hastie, 1993). Inadequate knowledge sharing leads to less than optimum problem solving by the group because individual group members are not able to evaluate a problem comprehensively with the limited information available to them (Lam & Schaubroeck, 2002). In order to solve a problem most effectively, all information relevant to the problem has to be taken into account (Lam & Schaubroeck, 2002), and group members need to actively exchange information with each other in order to access that information (Stasser & Titus, 2006; Toma & Butera, 2009).

One of the core drivers of creativity in organizations is the knowledge-based view where project teams' primary focus is to engage in knowledge sharing in order to integrate the diverse tacit and explicit knowledge (Grant, 1996). While possession of knowledge is at an individual level, it is important to incorporate this individual level knowledge into collective team knowledge for the project (Tiwana & McLean, 2005). However, research indicates that the process of sharing knowledge that is not common is difficult. Group members often tend to repeat the information known to all group members as the discussion progresses and do not share information that is not widely known (Larson, Christensen, Abbott, & Franz, 1996; Stasser, Taylor, & Hanna, 1989; Winquist & Larson, 1998). Moreover, it has been found that the amount of perceived expertise of the group members influences the knowledge sharing taking place in the group (Davenport, De Long, & Beers, 1998). In other words, individuals with higher levels of expertise are more willing to share their knowledge with their teammates than their less experienced counterparts. Conversely, when individual team members do not perceive themselves to be experts in their discipline, they are less likely to offer their unique observations to the group and contribute to knowledge sharing.

Trust is another important antecedent to knowledge sharing (Edmondson, 1999; Rank, Pace, & Frese, 2004). Research shows that increased trust allows team members to share information and knowledge more effectively (e.g. Edmondson, 1999; Gong et al., 2013). Trust not only influences the degree of knowledge sharing, that is, how willing the team members are to share the knowledge they have, but it also influences how the knowledge is viewed and integrated by other team members (Abrams, Cross, Lesser, & Levin, 2003). Lack of trust is sometimes an issue because of a team's diverse makeup. For example, an empirical study by Pinjani and Palvia (2013) showed that in virtual teams, deep level diversity (like cultural and language barriers) creates a more potent issue with mutual trust and knowledge sharing than visible functional diversity. As a result, teams that have deep levels of diversity may suffer from less than optimal communication and interactions resulting in subpar knowledge sharing and creativity.

In addition to trust, individuals must have a propensity to share knowledge in order to make the knowledge sharing a part of the team routine. But, there are various factors that may affect this desire to share information. Information is shared differently among group members who are familiar with each other than those who are not, which in turn affects the problem solving capabilities of the group (Gruenfeld, Mannix, Williams, & Neale, 1996). There are also certain social dilemmas associated with knowledge sharing which might impact the propensity to share knowledge. For example, if some of the group members have spent considerable time and resources to gather the knowledge, they might be unwilling to share that knowledge in a group setting (Cabrera & Cabrera, 2002). This reluctance becomes especially apparent when individuals are not sure how they would benefit by sharing their information (Boughzala & Briggs, 2011).

TCM posits that knowledge sharing does not contribute to team creativity directly but it contributes to the development of

shared mental models (SMMs), which in turn influence team creativity. SMMs are representations of knowledge structures that are shared among team members (Cannon-Bowers, Salas, & Converse, 1993; Klimoski & Mohammed, 1994). These shared structures enable the team members to find a common ground to describe, explain, and predict the events that occur in their environment (Mathieu, Goodwin, Heffner, Salas, & Cannon-Bowers, 2000). SMMs can be divided primarily into four areas: (a) knowledge about equipment and tools; (b) knowledge about the team task, goal, and performance requirements; (c) knowledge about other team members' abilities, knowledge, and skills; and (d) knowledge about appropriate team interactions (Cannon-Bowers et al., 1993). The majority of research on SMMs has focused on one of the above dimensions or has consolidated them into two dimensions: task and team shared mental models. SMMs are not created in one session with the team members. These are developed over time through discussion of issues, sharing knowledge, and learning from past mistakes and successes (Burke et al., 2006; Marks, Sabella, Burke, & Zaccaro, 2002; West & Anderson, 1996).

Even though research on SMMs and team creativity is limited, existing empirical studies suggest that SMMs have a positive relationship with creativity both at individual and team level. For example, Mumford, Feldman, Hein, and Nagao (2001) found that when shared mental models are developed through sharing the same training program, they facilitate higher levels of creative idea generation within the team. Similarly, Pearce and Ensley (2004) found shared vision to be positively related to product and process innovation ideas in teams. In a related study, Gilson and Shalley (2004) found that increasing the number of shared goals in a team not only resulted in an increase in the creativity but also increased the engagement of the team members in the creative process.

Based on the above discussion, Figure 1 depicts the various antecedents and their relationships proposed by the TCM. To perform an initial evaluation of the TCM, we carried out an exploratory case study with an International Telecom company. In this organization, a team of experts met in a series of creativity session to develop a new cellular phone model. The details of the case situation are described in the next section.

Figure 1. The Team Creativity Model

3. Method

3.1 Participants

The case study participants included eight experts from a telecom company who were engaged in four different creativity sessions to develop a new product (see Table 1). The involvement of industry experts in these sessions allowed us, in the words of Hevner, March, Park, and Ram (2004, p. 80) *"to combine relevance and rigor by meeting a business need with applicable knowledge."* Each of the team members had a minimum of a Master's degree and three of the team members had a PhD. The degrees were in a variety of disciplines: Industrial Design, Engineering, Management, Marketing, Sociology, Computer Science, and Telecom. Participants worked for different departments, including Strategic Marketing, Telecom Solutions, Sales, R & D, Quality, and IT. Their work experience ranged from 10 to 24 years. Their average age was 42 and 62% were male. All experts were native speakers or fluent in French. The participant names are withheld for privacy reasons. Their contributions are identified only by their ID and their department. The name of the company and the sessions' factual deliverables are confidential.

ID	Area	Department	Nationality	Age	Sex	Background	Degree	Work experience (yrs.)
E1	Marketing	Strategic Marketing	French	35-39	F	Marketing and Sociology	MBA	10-14
E2	Interface Design	R & D	Italian	40-44	M	Industrial Design	MSc	15-19
E3	Electronic Engineering	Telecom Solutions	German	40-44	M	Engineering	MSc	15-19
E4	Telecom Engineering	Telecom Solutions	French	40-44	M	Telecoms	PhD	15-19
E5	Software	IT	Tunisian	40-44	M	Computer Science	PhD	15-19
E6	Network architecture	IT	Venezuelan	40-44	M	Telecoms	MSc	15-19
E7	Quality of Service	Quality	French	40-44	F	Telecoms and Ergonomics	PhD	15-19
E8	Sales and CRM	Sales	French	45-49	F	Management	MBA	20-24

Table 1: Participants' demographic data.

3.2 Procedure

The participants worked as a team during four creativity sessions over a four-month period to co-design a new and innovative cellular phone model. Each session lasted three hours and was facilitated by one of the authors. All sessions were conducted in French. Graduate assistants recorded the sessions and made field notes about critical incidents and verbal statements during meetings. The facilitator made field notes immediately following every session. At the end of each session, participants were also asked to provide their personal perceptions in the form of comments, reflections, and questions about the team creativity process and the intermediate and final deliverables (the cellular phone model). To minimize the possibility of biasing the observations, we did not prime the participants with direct questions pertaining to the TCM constructs. Rather, we observed interactions among participants and documented their feedback. The session observers were not briefed on the TCM constructs until after the sessions were over. The participants were also not familiar with the creativity methods being used.

3.3 The Creativity Method

The collaboration process during the workshops was organized as a structured facilitation process (Briggs et al., 2003). To guide the design activities, the sessions used a specific creativity method, the Concept-Knowledge (C-K) method (Gillier, Piat, Roussel, & Truchot, 2010; Hatchuel & Weil, 2002), which was mandated by the case organization. The C-K method views expansion as a key focus in a design project. There are two expandable spaces: the Knowledge (K) space and the Concept (C) space. The K space consists of logical propositions relevant to the design project. These propositions are used to formulate new concepts or expand existing concepts. The C space consists of objects that meet some desired design requirements that do not yet exist. These objects typically represent the goal of design activities. The C-K design process lets the C and K spaces co-evolve by (1) allowing concepts in the C-space to expand with new properties based on propositions from the K space, and (2) expanding knowledge in the K-space through new insights from the experiences with the concepts that result from the design process.

The C-K method considers the design process as the co-evolution of C and K through four steps of interdependent operators (C-K, K-C, K-K, and C-C). The "disjunction CK" (K->C) allows for moving from knowledge to formulate a new concept of which the feasibility has to be checked. When a problem needs to be solved based on existing applicable knowledge, it is called "conjunction CK" (C->K). This transforms a concept into knowledge, which can also be added to the applicable knowledge base. It is symmetrical to disjunction and it marks the time when a team has finished designing a new solution. Design reasoning can lead to several operations of conjunction from one disjunction. When no expansion is possible, it is called a K->K operation. A C->C operation occurs when a concept is partitioned or naturally evolved in one or more new concepts.

Thus, the C-K method helps individuals and teams to innovate by stimulating them to get out of the box when they aim to create a new product or service. The method is based on the concept of “expandable rationality” (Hatchuel & Weil, 2002). The C-K method aims to streamline a design process and make it more structured and relevant. It allows exceeding the simple problem-solving theory by the operationalization of the concept of “expandable rationality” (Hatchuel & Weil, 2002). It further allows training people to avoid design illusions, memorizing the history of a design process and structuring/organizing team work in innovative design projects.

3.4 Creativity Sessions

The main goal of each of the four creativity sessions was to conceptualize and design a new cell phone model without a SIM card in response to cloud computing developments. Each creativity session focused on one step of the C-K method. First, a cell phone was initially defined to consist of the following components: Screen, Keyboard, Microphone, Earphone, Transceiver/antenna, SIM card, Operating System, Services/Apps, and Camera. Second, the SIM card concept was removed. The participants had to try to expand the other components such that they would fulfill the requirements of the new phone model. Finally, the participants had to integrate the expanded components such that they would envision a new cell phone model that still offered the same functionality as a traditional cell phone.

Each session was organized at a different department of the organization. Furniture was arranged in a U-shape to facilitate eye contact between the participants. Each session was started with a brief presentation by the facilitator to introduce the session agenda and to summarize progress so far in process. Participants also received guidelines on how to share their ideas and on justifying their ideas with precise arguments and/or concrete examples. Participants then generated, clarified, reduced, organized, and evaluated ideas concerning the new cell phone design. At the end of each session, participants were asked to provide feedback about the teamwork and the execution of the session.

Specific details on each of the four sessions are provided in Table 2. Each session was considered a success from the perspective of intended deliverables. The final deliverable from the four sessions was a specification report for the new cellular phone model. The company’s management was very satisfied with this final outcome of the project and decided to initiate the next phase in their innovation process, which focused on the technical aspects of developing an initial prototype.

Session	Focus
1	Review of recent cell phone trends and evolutions in telecom industry. Key cell phone adoption and marketing drivers.
2	Removal of SIM card concept. Expansion of remaining concepts. Technical feasibilities and constraints related to design, cost, legal, health, and market concerns.
3	Development of solutions and scenarios based on technical possibilities, market situations, and competitors.
4	Evaluation of previously formulated solutions and scenarios. Selection of final solution. Project debrief.

Table 2. Details of the creativity sessions.

3.5 Analysis

The facilitator and graduate assistants transcribed the sessions’ and participants’ notes into a collection of contributions identified by contributor (51, 37, 40, and 45 contributions for sessions 1, 2, 3, and 4, respectively). They then anonymized this data by replacing the contributors’ names with their respective ID. The facilitator then coded the contributions according to the TCM constructs, by placing each contribution in an area that was labeled with the corresponding TCM construct. After placing the contributions, similar contributions within a TCM construct category were grouped together if they appeared to make an identical or strongly related statement. Next, all contributions were translated into English. Someone fluent in both English and French validated the translation and found it to be accurate. An English-speaking researcher then coded the contributions according to the TCM constructs in a similar fashion as the initial French contributions. The English-speaking researcher was not aware of the results of the French coding. Comparing the two coding results revealed high initial inter-rater reliability between the French and English coders: Over 90% of the contributions were placed in the same TCM construct category by both coders. The remaining discrepancies in contribution placement were successfully resolved through discussion.

4. Results

This section presents an analysis of the contributions in light of the constructs and relationships proposed by TCM. Many of the contributions from the participants about propensity to share, propensity to create, knowledge sharing, shared mental models, and individual and team creativity were consistent with the constructs and relationships proposed by TCM. This section presents qualitative evidence to support the model constructs.

4.1 Antecedents to knowledge sharing

Propensity to share knowledge, trust within team, and individual knowledge are the three antecedents of knowledge sharing as identified by the TCM. The presence of these antecedents was examined in the sessions with the experts. Results show strong support for the role of trust in sharing knowledge. It was obvious in most sessions that trust played a significant role in establishing an environment where the experts could share their knowledge easily. Many experts commented to that effect. For example, one of them from the Sales department (E8, S4) said, *"The fact that we belong to the same company helps to build mutual trust... sharing was almost natural."* Another expert from the Quality department (E7, S4) mentioned, *"An innovation process goes smoothly and quickly when people are in good agreement, have trust in each other."* However, initial levels of trust may have been relatively lower. The team appeared to have built trust over time and they seemed to be cognizant of the changes that took place in the team. Said one of the experts from the Telecom department (E4, S3) *"Gradually, as the work progressed during the sessions, team spirit was established and trust was established between us from different departments."* This was echoed by another participant (E2, R&D Department), *"Trust was established as soon as things started to take shape and become clear to everyone ...in the beginning people test each other."*

There was also support that a propensity to share knowledge is required for knowledge sharing. This was evidenced in the following comment *"Creativity may seem like an individual concern but eventually it's well done in teams if people are willing to share/combine their knowledge and expertise"* (Strategic Marketing - E1, S3). Interestingly, the experts mostly commented on the propensity to share knowledge in combination with the importance of possessing individual knowledge. For example, one of the experts (Telecom department – E3, S1) mentioned, *"It is not only the matter of willingness to share...but also having something to share and being able to do it."* This sentiment was also experienced in another session where it was said *"The willingness to share comes first and you must have knowledge and be able to share it ... the method helps a lot for that"* (Quality department – E7, S2).

A number of experts also acknowledged a strong relationship between individual knowledge and knowledge sharing. Experts felt that team creativity requires knowledge sharing when people combine their individual knowledge: *"In our business, creativity is no longer an individual concern but the collaboration/pooling of several specialties and skills"* (R&D department – E2, S4). As evidenced by a comment from an expert from the IT department (E6, S2), for knowledge sharing to take place, it does require the presence of individual knowledge: *"... having something to share to be able to share."* In fact, some experts believed that individual knowledge would only become valuable in a team project if it were shared. Said one expert from the R&D department (E2, S4), *"Knowledge is the only resource which has more value when you share it."*

4.2 Antecedents to individual creativity

Propensity to be creative and individual knowledge were also assessed in the sessions as antecedents to individual creativity. We found support for the propensity to be creative and moderate support for individual knowledge being an antecedent for creativity at an individual level. While talking about creativity, one of the experts from the Telecom department (E4, S4) mentioned, *"To get out of the box, one must be ready for that"* alluding to the idea that they should also have the attitude to be creative. Another expert from the R&D department (E2, S2) had something similar to say about his department, *"We can say that people were willing and predisposed to create an innovative solution."* The experts not only mentioned the predisposition to be necessary, they also noticed the importance of propensity to be creative after the sessions were over: *"This is a difficult but exciting exercise ... when we see the outcome, it's impressive for a short time ... eventually one has to be predisposed to it"* (Quality department - E7, S4).

Support for individual knowledge as an antecedent to individual creativity came from comments such as *"In this creativity session, trust and challenge were always our Leitmotiv [i.e. guiding theme] ...we also should have good*

knowledge to share" (IT department – E5, S2). They also commented on the selection of the experts as they contributed to the knowledge pool. For example, one of the experts from the Sales department (E8, S1) said, *"The choice of experts was important..."*

4.3 Individual creativity as an antecedent to team creativity

Individual creativity was named as one of the antecedents to team creativity in the TCM. This was illustrated on several occasions during the creativity sessions providing strong support to the model. One of the experts from the Sales department (E8, S4) mentioned that *"1+1=3... it's more than the sum of everyone's knowledge"* to point out the fact that the sum of individual creativities produced a synergy when working in teams. The experts from different sessions were also in agreement that creativity has become more than an individual endeavor. Comments like *"In our business, creativity is no longer an individual concern but the collaboration/pooling of several specialties and skills"* (R&D department – E2, S1) illustrate this fact. Some experts also mentioned their support of combining individual creativity to achieve a team outcome: *"Creating is always easier collectively"* (Strategic Marketing department – E1, S3).

The participants also seemed to be very impressed with the amount of creative ideas that were generated by the use of experts from different departments. For example, one of the participants (Sales department – E8, S3) mentioned, *"The choice of experts was important ... I believe that they are all creative and sensitive to knowledge sharing and creativity."* Other comments that were received in support of this attitude were *"I'm not sure we could be able to achieve the same result with a single point of view, in the same department ... especially in such a short time"* (R&D department – E2, S4) and *"The fact that the group is mixed... Views are complementary and rich that helps to innovate,"* (Sales department – E8, S1) and *"The team is balanced ... each of us brings a stone to the edifice"* (Quality department – E7, S2).

4.4 Knowledge sharing and shared mental models as antecedents to team creativity

Knowledge sharing and shared mental models are the proposed antecedents to team creativity in the TCM. SMMs directly influence team creativity, while shared knowledge influences team creativity through SMMs. We found strong support for both relationships. The experts involved in the creativity sessions acknowledged the importance of knowledge sharing in the creation of an SMM. To this effect, one of the experts (Sales department – E8, S3) commented, *"This [i.e. the creativity session] strengthens our interest to sharing our knowledge capital and create mental schemas."* Another expert from the R&D department (E2, S4) mentioned *"I did not think that people would be able to share their knowledge so easily and with a goodwill... converging their so different points of view."* Sharing knowledge was an obvious prerequisite to producing an innovative team results for one of the Quality department participant, who felt that this was facilitated by a desire to work together towards a good result: *"I believe we were lucky to all have the perspective that we wanted to succeed and therefore shared ideas to be able to create and innovate together"* (E7, S2).

The participants were aware of the process that took place in order to create a shared mental model. They expressed sentiments like *"In the beginning, there was some uncertainty in the project... but once we advanced in the process of the method, there was a reconciliation and shared understanding ... the method proved useful and credible for everybody"* (Strategic Marketing department – E1, S4). And, *"The time we spent together was very challenging to overcome our differences ... yet it was the source of our strength to be able to create"* (Sales department – E8, S1). They were also impressed by the effect of knowledge sharing on team creativity. Said one expert (IT department – E5, S4) *"... sharing our knowledge and know-how was the only way for us to be able to create together."* He expressed his surprise at the degree of creativity resulting from the knowledge sharing exercise by saying *"I've never imagined the usefulness of this method by constraining us to surpass and force ourselves to be creative together despite our differences."*

The experts also acknowledged the importance of shared mental models in the team creativity outputs. Their understanding of the influence of shared mental models on team creativity was reflected by comments such as *"Innovation processes go smoothly and quickly when people ... have the same aspirations and perceptions"* (Quality department – E7, S1) and *"In this exercise, everyone must be on the same wavelength, I mean 'the same tempo'"* (IT department – E5, S3). Yet, being on the same wavelength does not imply that the experts came from similar backgrounds in terms of expertise or experience. On the contrary: *"We observe things with different lenses ... not necessarily a good technology gives rise to a successful innovation"* (Strategic Marketing department – E1, S1). The experts even accepted and welcomed the challenges of working with people from different departments so that they could benefit from the rewards of team creativity once a shared mental model was established. Comments (Sales department – E8, S3; Quality

department – E7, S2 & E7, S4) like “*We do not have the same vocabulary, the same concerns and the same points of view... but we were able to work together and innovate,*” “*The time we spent together was very challenging to overcome our differences ... yet it was the source of our strength to be able to create,*” and “*In such a process of a innovation, different specialties must converge to a feasible, relevant and profitable solution*” illustrate that point.

5. Discussion and Conclusions

This paper advances the Team Creativity Model (TCM) to understand the antecedents of team creativity. TCM posits that both individual creativity and shared mental models (SMMs) contribute to team creativity. SMMs act as mediators between knowledge sharing and team creativity. Antecedents to individual creativity include an individual’s propensity to be creative and individual knowledge. Individual knowledge also is an antecedent to knowledge sharing, as are an individual’s propensity to share knowledge and trust within the team. During the exploratory case study in a telecom company, feedback from experts that participated in four creative design sessions and research observations provided initial support for the TCM constructs and their relationships. These findings suggest that further exploratory research is merited. They also allow us to tentatively present a number of implications for research and practice.

TCM is based on a synthesis of research efforts on various aspects of individual and team creativity. The model and related field data suggest that studying team creativity requires careful consideration of a complex set of constructs and relationships. To empirically study team creativity, we need to consider not only individual creativity, but also important antecedents to individual creativity and the development of SMMs during the creative team process. Further, it can be argued that a deeper understanding of nature of relationships between constructs is required. For example, what is the exact nature of the relationship between SMMs and team creativity? Do SMMs just lead to higher idea generation productivity in teams? Or, do SMMs just facilitate the selection of the most creative ideas? Or do they support both idea generation and selection? In fact, it has been suggested that SMMs may lead to too much similarity and therefore conformity (Cannon-Bowers et al, 1993). It is possible that some degree of dissimilarity in SMMs or a lesser degree of sharing would be beneficial especially for team creativity and innovation. The same questions can be raised with respect to knowledge sharing: What is the optimal level of knowledge sharing to support the formation of SMMs?

Our model and findings also provide insights for organizations that employ teams in creative problem solving activities. In particular, it can be argued that if the logic of TCM holds, then organizations must investigate strategies to increase the formation of SMMs and the amount of knowledge that is shared. Several such strategies have been suggested by researchers. For example, discussion and planning have been proposed as a strategy to facilitate the formation of SMM (Seeber, Maier, Weber, de Vreede, de Vreede, & Alothaim, 2015). Through discussion and planning, team members become aware of more aspects on how the creative task has to be executed, the role of different members, and possible difficulties each person may need to address. Indeed, Stout, Cannon-Bowers, Salas, and Milanovich (1999) have found that planning is a way to develop shared mental models that facilitate team performance. Organizations can also structure interventions to bring about social dynamics that increase the level of knowledge sharing (Cabrera & Cabrera, 2002). One such intervention would be to restructure group rewards such that there are greater payoffs for contributing. Another intervention can be to increase the sense of group efficacy as well as the perception of the impact that individuals believe their contributions have on the group. To illustrate this point, Kerr (1992) showed that the knowledge sharing in a group reduced when the group size increased and group member’s perception of their contribution decreased. A final intervention focuses on establishing a sense of group identity through increased communication among team members (Dawes, 1991). When individuals feel that they are part of a group, they are more likely to share information (Bonacich & Schneider, 1992).

The following limitations have to be taken into account when interpreting the results of this study. First, the support for the TCM proposed in this paper originated from limited field observations and expert feedback from a single case organization. As such, this research only represents a first yet important step in theory development. Further data collection from organizations in different sectors or from cross-organizational collaborations is required to more broadly examine the extent to which the constructs of TCM manifest in the field. Second, although the field data offers support that the TCM constructs are related, the nature of an exploratory study is such that it cannot assert causality. Therefore, further theoretical research and empirical studies are required to find support for causal relationships between TCM constructs. Finally, it was not possible through this case study to actually measure the individual TCM constructs, in particular individual creativity and team creativity. Such measurements would have been useful to gain a deeper understanding of the relationship between individual and team creativity as well as between other TCM constructs.

We envision a number of avenues for further research. First, given the findings reported in this paper, it will be necessary to explore the TCM more fully through additional qualitative studies with different creative problem solving or design teams. Second, some initial confirmatory quantitative studies can also be designed to use Structural Equation Modeling (Bollen, 1989) to investigate the relationships between TCM constructs and the mediation relationship between knowledge sharing and SMMs. A particularly interesting aspect for future research would be the extent to which mutual respect between team experts foster knowledge sharing and SMM development. The case results showed high levels of respect, which may have positively affected cooperation and knowledge sharing. However, it is not uncommon for individuals to devalue the credibility of colleagues with different backgrounds and skills. Finally, it would be useful to examine the fundamental assumption that gives rise to the development of the TCM, namely that team creativity ultimately leads to higher innovation quality.

Acknowledgments

We are grateful for the constructive feedback and suggestions from the reviewers and editorial team.

References

- Abrams, L.C., Cross, R., Lesser, E., & Levin, D.Z. (2003). Nurturing interpersonal trust in knowledge-sharing networks. *Academy of Management Executive*, 17, 64-77.
- Agres, A., Vreede, G.J. de, & Briggs, R. (2005). A tale of two cities: case studies of GSS transition in two organizations. *Group Decision and Negotiation*, 14, 267-284.
- Amabile, T. M. (1983). *The social psychology of creativity*. NY: Springer-Verlag.
- Amabile, T. M. (1996). *Creativity in context: Update to the social psychology of creativity*. Boulder, CO: Westview Press.
- Anson, R. & Munkvold, E. B. (2004). Beyond face-to-face: a field study of electronic meetings in different time and place modes, *Journal of Organizational Computing and Electronic Commerce*, 14,127-152.
- Bollen K. A. (1989). *Structural Equations with Latent Variables*, Wiley.
- Bonacich P., & Schneider, S. (1992). Communication networks and collective action. In W.G. Liebrand, D.M. Messick, H.A.M. Wilke (Eds.) *A Social Psychological Approach to Social Dilemmas*, (pp. 128-278), Oxford: Pergamon.
- Boughzala I. & Briggs R. O. (2011). Knowledge sharability in cross-organizational collaboration: an exploratory field study. Paper presented at the Hawaii International Conference on System Sciences (HICSS 44), IEEE Computer Society, 4-7 January, Kauai, Hawaii.
- Briggs, R. O., Vreede, G. J. de, & Nunamaker, J. F., Jr. (2003). Collaboration Engineering with ThinkLets to Pursue Sustained Success with Group Support Systems. *Journal of Management Information Systems*, 19, 31-63.
- Burke, C., Stagl, K., Salas, E., Pierce, L., & Kendall, D. (2006). Understanding team adaptation: A conceptual analysis and model. *Journal of Applied Psychology*, 91, 1189-1207. doi:10.1037/0021-9010.91.6.1189.
- Cabrera, A. & Cabrera, E.F. (2002). Knowledge-Sharing Dilemmas, *Organization Studies*, 23, 687- 710.
- Campbell, D. T. (1960). Blind variation and selective retention in creative thought as in other knowledge processes. *Psychological Review*, 67, 380 - 400.
- Cannon-Bowers, J. A., Salas, E., & Converse, S. A. (1993). Shared mental models in expert team decision making. In N. J. Castellan, Jr. (Ed.), *Current issues in individual and group decision making* (pp. 221-246). Hillsdale, N J: Erlbaum.
- Carter, S. M., & Greer, C. R. (2013). Strategic Leadership: Values, Styles, and Organizational Performance. *Journal of Leadership & Organizational Studies*, 1548051812471724.
- Collaros, P. A. & Anderson, L. R. (1969). Effect of perceived expertness upon creativity of members of brainstorming groups. *Journal of Applied Psychology*, 53, 159-163.
- Cropley, A. (1967). *Creativity*. London: Longmans
- Davenport, T. H., De Long, D. W. & Beers, M. C. (1998). Successful knowledge management projects. *Sloan Management Review*, 36, 43-57.
- Dawes, R. M. (1991). Social Dilemmas, economic self-interest, and evolutionary theory. In D. R. Brown & J. E. K. Smith (Eds.), *Frontiers of mathematical psychology: Essays in honor of Clyde Coombs*. New York: Springer-Verlag.
- Devine, D.J., Clayton, L.D., Phillips, J.L., Dunford, B.B., & Melner, S.B. (1999). Teams in organizations: Prevalence, characteristics, and effectiveness. *Small Group Research*, 30, 678- 711.
- Edmondson, A. (1999). Psychological safety and learning behavior in work teams. *Administrative Science Quarterly*, 44, 350-383.
- Edmondson, A.C., & Roloff, K.S. (2009). Overcoming barriers to collaboration: Psychological safety and learning in diverse teams. In: E. Salas, G.F. Goodwin, C.S. Burke, (Eds.) *Team effectiveness in complex organizations: Cross-disciplinary perspectives and approaches*. New York: Routledge/Taylor & Francis Group.
- Ericsson, K. A. (1999). Creative expertise as superior reproducible performance: Innovative and flexible aspects of expert performance, *Psychological Inquiry*, 10, 329-333.

- Gardner, H. (1988). Creativity: An interdisciplinary perspective. *Creativity Research Journal*, 1, 8-26.
- George, J. M. (2007). Creativity in organizations. In J. P. Walsh & A. P. Brief (Eds.), *Academy of Management annals*, 1, 439 – 477. New York: Erlbaum.
- Getzels, J. W., & Csikszentmihalyi, M. (1976). *The creative vision: A longitudinal study of problem finding in art*. New York: Wiley.
- Gigone, D., & Hastie, R. (1993). The common knowledge effect: Information sharing and group judgment. *Journal of Personality and Social Psychology*, 65, 959–974.
- Gillier, T., Piat, G., Roussel, B., & Truchot, P. (2010).Managing innovation fields in a cross-industry exploratory partnership with C-K design theory. *Journal of Product Innovation Management*, 27, 883-896.
- Gilson, L. L., & Shalley, C. E. (2004). A little creativity goes a long way: An examination of teams' engagement in creative processes. *Journal of Management*, 30. 453– 470.
- Gong, Y., Kim, T. Y., Lee, D. R., & Zhu, J. (2013). A multilevel model of team goal orientation, information exchange, and creativity. *Academy of Management Journal*, 56(3), 827-851.
- Grant, R. M. (1996). Prospering in dynamically competitive environments: Organizational capability as knowledge integration, *Organization Science*, 7, 375-387.
- Groves, K. S. (2014). Examining Leader–Follower Congruence of Social Responsibility Values in Transformational Leadership. *Journal of Leadership & Organizational Studies*, 21, 227-243.
- Gruenfeld, D. H., Mannix, E. A., Williams, K. Y., & Neale, M. A. (1996). Group composition and decision making: How member familiarity and information distribution affect process and performance. *Organizational Behavior and Human Decision Processes*, 67, 1–15.
- Hatchuel A., Weil B. (2002). C-K theory: Notions and applications of a unified design theory. Proceedings of the Herbert Simon International Conference on “Design Science” Lyon, 15-16 March 2002.
- Hennessey, B. A., & Amabile, T. M. (2010). Creativity. *Annual Review of Psychology*, 61, 569–598.
- Hevner A. R., S. T. March, J. Park, and S. Ram. (2004). Design Science in Information Systems Research. *MIS Quarterly*, 28, 1.
- Hoegl, M., Weinkauff, K., & Gemuenden, H. G. (2004). Interteam Coordination, Project Commitment, and Teamwork in Multiteam R & D Projects: A Longitudinal Study, *Organization Science*, 15, 38-55.
- Iansiti, M. & West J. (1997), Technology Integration: Turning Great Research into Great Products,” *Harvard Business Review*, 75, 69–79.
- Jordan, P. J., Ashkanasy, N. M., Härtel, C. E. J., & Hooper, G. S. (2002). Workgroup emotional intelligence: Scale development and relationship to team process effectiveness and goal focus. *Human Resource Management Review*, 12, 195-214.
- Kerr, N. L., & Tindale, R. S. (2004). Group performance and decision making. *Annual Review of Psychology*, 55, 623–655.
- Kerr, N. L. (1992). Group decision making at a multialternative task: Extremity, interaction distance, pluralities, and issue importance. *Organizational Behavior and Human Decision Processes*, 52, 64-95.
- King, N., & Anderson, N. (1990). Innovation in Working Groups. In M. A. West and J. L. Farr (Eds.), *Innovation and Creativity at Work*. New York: Wiley,
- Klimoski, R., & Mohammed, S. (1994). Team mental model: Construct or metaphor? *Journal of Management*, 20, 403-437.
- Kozlowski, S. J., & Bell, B. S. (2008). Team learning, development, and adaptation. In V. I. Sessa, & M. Fondon (Eds.), *Work group learning* (pp. 15-45). NY: Lawrence Erlbaum.
- Kozlowski, S. W. J., & Klein, K. J. (2000). A multilevel approach to theory and research in organizations: Contextual, temporal, and emergent processes. In K. J. Klein & S. W. J. Kozlowski (Eds.), *Multilevel theory, research, and methods*

in organizations: Foundations, extensions, and new directions (pp. 3–90). San Francisco: Jossey-Bass.

Lam, S.S.K., & Schaubroeck, J. A. S. (2002). Relationship between organizational justice and employee work outcomes: a cross-national study. *Journal of Organizational Behavior*, 23, 1–18.

Larson J.R., Christensen C., Abbott A.S., Franz T.M. (1996). Diagnosing groups: charting the flow of information in medical decision making teams. *Journal of Personality and Social Psychology*, 71, 315–30

Leenders, R.T., van Engelen, A.J., & Kratzer, J., (2003) Virtuality, Communication, and New Product Team Creativity: A Social Network Perspective, *Journal of Engineering and Technology Management*, 20, 69-92.

Marks, M.A., Sabella, M.J., Burke, C.S., & Zaccaro, S.J. (2002). The impact of cross-training on team effectiveness. *Journal of Applied Psychology*, 87, 3–13.

Mathieu, J. E., Goodwin, G. F., Heffner, T. S., Salas, E., & Cannon-Bowers, J.A. (2000). The influence of shared mental models on team processes and performance. *Journal of Applied Psychology*, 85, 273-283.

Mitchell, R., Boyle, B., & Nicholas, S. (2009). The impact of goal structure in team knowledge creation. *Group Processes & Intergroup Relations*, 12, 639-651. doi:10.1177/1368430209340568.

Mumford, M.D., Feldman, J.M., Hein, M.B., & Nagao, D.J. (2001). Tradeoffs between ideas and structure: Individuals versus group performance in creative problem solving. *Journal of Creative Behavior*, 35, 1-23.

Mumford, M.D., Mobley, M.I., Uhlman, C.E., Reiter-Palmon, R., & Doares, L.M., (1991). Process analytic models of creative thought. *Creativity Research Journal*, 4, 91–122.

Pearce, C., & Ensley, M. (2004). A reciprocal and longitudinal investigation of the innovation process: The central role of shared vision in product and process innovation teams (PPITs). *Journal of Organizational Behavior*, 25, 259-278. doi:10.1002/job.235. Pirola-Merlo & Mann, 2004

Pinjani, P., & Palvia, P. (2013). Trust and knowledge sharing in diverse global virtual teams. *Information & Management*, 50(4), 144-153.

Pirola-Merlo, A., Hartel, C., Mann, L., & Hirst, G. (2002). How leaders influence the impact of affective events on team climate and performance in R&D teams. *Leadership Quarterly*, 13, 561-581.

Rank, J., Pace, V. L. & Frese, M. (2004). Three avenues for future research on creativity, innovation, and initiative. *Applied psychology: An International Review*, 53, 518- 528.

Rivlin, L.G. (1959). Creativity and the self-attitudes and sociability of high school students. *Journal of Educational Psychology*, 50, 147-152.

Santanen, E.L., Briggs, R.O., & Vreede, G.J. de (2004). Causal relationship in creative problem solving: Comparing facilitation interventions for ideation. *Journal of Management Information Systems*, 20, 167-197.

Seeber, I., Maier, R., Weber, B., Vreede, G.J. de, Vreede, T. de, & Alothaim, A. (January, 2015). Brainstorming is just the beginning: Effects of convergence techniques on satisfaction, perceived usefulness of moderation, and shared understanding in teams, *Proceedings of the 48th Hawaiian International Conference on System Science*. Los Alamitos: IEEE Computer Society Press.

Stacey, M. K., Eckert, C. M., & Wiley, J. (2002). Expertise and creativity in knitwear design. *International Journal of New Product Development and Innovation Management*, 4, 51–66.

Stasser, G. & Titus, W. (2006). Pooling of unshared information in group decision making: Biased information sampling during discussion. In John M. Levine & Richard L. Moreland (Eds.), *Small Groups* (pp.227-239). New York: Psychology Press.

Stasser, G., Taylor, L.A., & Hanna, C. (1989). Information sampling in structured and unstructured discussions of 3-person and 6-person groups. *Journal of Personality and Social Psychology*, 57, 67–78.

Stein, M. I. (1965). Several findings of a transactional approach to creativity (Chap. 9). In Steiner, G. A. (Ed.), *The creative organization*. Chicago, IL: University of Chicago Press

Stout, R.J., Cannon-Bowers, J.A., Salas, E., & Milanovich, D.M. (1999). Planning shared mental models, and coordinated performance: An empirical link is established. *Human Factors*, 41, 61-71.

- Tagger, S. (2002). Individual creativity and group ability to utilize individual creative resources: A multilevel model. *Academy of Management Journal*, 45, 315–330.
- Tesluk, P. E., Farr, J. L., & Klein, S. R. (1997). Influences of organizational culture and climate on individual creativity. *Journal of Creative Behavior*, 31, 27–41.
- Thamhain, H.J. (2003). Managing Innovative R & D Teams. *R & D Management*, 33, 297–311.
- Tiwana A, & McLean E.R. (2005). Expertise integration and creativity in information systems development. *Journal of Management Information Systems*, 22, 13–43.
- Toma C., & Butera F. (2009). Hidden profiles and concealed information: Strategic information sharing and use in group decision making. *Personality and Social Psychology Bulletin*, 35, 793-806.
- Vincent, P. H., Decker, B. P., & Mumford, M. D. (2002). Divergent thinking, intelligence, and expertise: A test of alternative models. *Creativity Research Journal*, 14, 163–178.
- Weick, K. E. (2012). Organized sensemaking: A commentary on processes of interpretive work. *Human Relations*, 65, 141-153.
- West, M. A., & Anderson, N. R. (1996). Innovation in top management teams. *Journal of Applied Psychology*, 81, 680-693.
- Winqvist, J. R. & Larson, J. R. (1998). Information pooling: When it impacts group decision making. *Journal of Personality and Social Psychology*, 74, 371–77.
- Woodman, R. W., J. W. Sawyer, & R. W. Griffin (1993). Toward a theory of organizational creativity. *Academy of Management Review*, 18, 293–321.
- Zimmer, J. C., Tams, S., Craig, K., Thatcher, J., & Pak, R. (2015). The role of user age in task performance: examining curvilinear and interaction effects of user age, expertise, and interface design on mistake making. *Journal of Business Economics*, 85(4), 323-348.

Author Biographies

Triparna de Vreede is a visiting faculty at the Muma College of Business at the University of South Florida. She holds a PhD in Industrial/Organizational Psychology from the University of Nebraska at Omaha and graduate degrees in Management Information Systems and Business Administration (HRM). She combines interdisciplinary business perspectives to create engaging learning environments. She also is the founder/director of Chrysalis Consulting – a personal and organizational development firm that specializes in executive coaching, intra-organizational trainings, wellness and life coaching, evidence based decision-making, and facilitation of creative workshops. Her research, practice, and teaching involve topics such as *People Analytics*, *Principles of Collaboration*, *International Management*, and *Global Information Systems*. She has published several book chapters and presented her research at leading conferences, such as ECIS, HICSS, APA, and SIOP.

Imed Boughzala is Professor of Management Information Systems and Dean of the Faculty at the Telecom Ecole de Management of the Mines-Telecom Institute, France. He holds an EMBA, a Ph.D. and two Habilitation degrees from Mines-Telecom Institute, Paris VI Pierre & Marie Curie University, and Nantes University. His research interests focus on Digital Transformation, Collaboration Engineering, Knowledge Management, and Serious Games. He is working with several major French and international companies and facilitated several brainstorming and creativity sessions (using design thinking/engineering, Lego serious play, C/K theory). He is the author of several books and numerous scientific and professional articles in journals such as *Journal of Management Information Systems*, *Journal of the AIS*, *International Journal of Information Management*, *Electronic Markets*, and *Information Systems Frontiers*. He is a member of the editorial board of *Information and Management* and *Journal of Organizational and End User Computing*. He is also expert-columnist at Harvard Business Review France.

Gert-Jan de Vreede is Professor of Information Systems and Decision Sciences at the Muma College of Business at the University of South Florida. Previously, he was the Charles & Marge Durham Distinguished Professor of Interdisciplinary Informatics at the University of Nebraska at Omaha and the Founding Director of the University's Center for Collaboration Science. He received his PhD in Systems Engineering from Delft University of Technology in the Netherlands. Currently his research focuses on crowdsourcing, Collaboration Engineering, creativity, and Agile project management and development. His research has appeared in journals such as *Journal of Management Information Systems*, *Management Information Systems Quarterly Executive*, *Journal of the Association for Information Systems*, *Communications of the Association for Information Systems*, *Small Group Research*, *Group Decision & Negotiation*, and *Communications of the ACM*.

Roni Reiter-Palmon is the Varner Professor of Industrial/Organizational (I/O) Psychology and the Director of the I/O Psychology Graduate Program at the University of Nebraska at Omaha (UNO). She also serves as the Director for the Center for Collaboration Science at UNO. She received her Ph.D. in I/O Psychology from George Mason University, Fairfax, Virginia. Her research focuses on creativity and innovation in the workplace, cognitive processes and individual difference variables that influence creative performance of individuals and teams, leading creative individuals, and development of creativity and leadership skills. Her applied experiences include consulting and grants from Fortune 500 companies, government, military, and non-profits. She published in *Journal of Applied Psychology*, *Creativity Research Journal*, *The Psychology of Aesthetics*, *Creativity and the Arts*, *Human Resources Management Review*, *Journal of Creative Behavior*, *Journal of Occupational and Organizational Psychology*, and *Leadership Quarterly*. She is the Editor of *The Psychology of Creativity*, *Aesthetics and the Arts* and an associate editor for the *European Journal of Work and Organizational Psychology*. She serves on the editorial boards of *Journal of Organizational Behavior*, *The Leadership Quarterly*, *Journal of Leadership and Organizational Studies*, *Journal of Business and Psychology*, *Journal of Creative Behavior*, and *International Journal of Problem Solving and Creativity*.