Fueling Virtual Teams with Creativity through Composition of Private and Public Workspaces

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Short Paper

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Abstract

Driven by the ubiquitous ICTs, mobile/virtual working came into prevalence and enabled contemporary knowledge workers to work anytime, anywhere. However, some companies recently ended the work-from-home policy and required employees of “presenteeism”, since they believed that employees would be more collaborative and innovative when they were together. The emerging practices raising a workspace puzzle that is overlooked in the literature. We drew insights from environmental psychology and integrative complexity to examine how members’ workspaces and their composition influences virtual team creativity. The proposed model intended to answer two research questions: 1) what are the influences of private and public workspace on virtual team creativity? 2) whether and how do team socio-cognitive processes (i.e., task conflict and relational conflict) mediate these influences? We will conduct a controlled lab experiment to empirically examine this model.

Keywords: Virtual teams, workspace composition, team creativity, exploitation and exploration, team conflict, environmental psychology, integrative complexity

Introduction

The proliferation and customization of information communication technologies (ICTs) has profoundly contributed to the rise of new work arrangements, such as mobile or remote working. With the ubiquitous computing infrastructures, contemporary knowledge workers are particularly afforded to work anytime, anywhere (Davis 2002). As of 2010, 10% of the workforce were working from home at least one day a week and 4.3% were primarily working from home in the United States (Census 2010). It was estimated that more than 1.3 billion people would work virtually with the next few years (Johns and Gratton 2013).
Virtual Team Creativity, Workspace Composition, and Conflict

The prevalence of mobile working can be a source of both opportunity and challenge. Mobile knowledge workers possess higher levels of temporal and spatial flexibility, which is characterized with working in a broad range of spaces beyond traditional offices, such as home, café, airports, and even cars (Felstead et al. 2005; Hislop and Axtell 2009; Jarrahi et al. 2017). Previous studies showed that working from home could be beneficial on increasing employees’ perceived autonomy, mitigating work-family conflict, and even benefits some long-term outcomes such as job satisfaction, performance, and stress (see Gajendran and Harrison 2007, for a meta-analysis). Equally intriguing are the findings from a public setting (e.g., café, lobbies and urban hubs). For example, scholars of environmental psychology found that open square-like place with visibility and transparency among co-workers encouraged interactions (Sundstrom and Sundstrom, 1986) and facilitated creativity (McCoy and Evans 2002).

However, working in various spaces, particularly in non-traditional spaces, is by no means easy, and produces many challenges for employees. Working from home also showed negative effects such as isolation (Golden et al. 2008), decreasing interaction (Iscan and Naktiyok 2005), and increasing costs of coordination (Daniels et al. 2001). In addition, crowded space and noises in the public setting may reduce privacy and concentrations (Shalley and Oldham 1997; Stokols et al. 2002), endangering productivity and performance as well. This might partially explain why some early practitioners of mobile/tele-working started to question it. For instance, Yahoo ended its popular work-from-home policy in 2013 because they believed that employees were more collaborative and innovative when they were together (Tkaczyk 2013). Best Buy and Honeywell joined the rank of banning telework in 2013 and 2016, respectively (DePass 2016). The most dramatic example might be IBM, the pioneer of remote work in 1980s, called thousands of employees back to the office to work “shoulder to shoulder” in 2017 (Kessler 2017).

Given the previous implications for individual mobile workers, it poses a puzzle that reveals firms struggling on the spatial hybrid (Halford 2005) and blurred boundaries of work/non-work, and the public/private space (Cohen 2010; Felstead et al. 2005) due to mobile/tele-work. As organizations increasingly rely on teams to transact a variety of activities especially knowledge-intense work (Griffith et al. 2003), mobile knowledge workers commonly collaborate with their distant colleagues as the form of virtual teams (e.g., Tzabbar and Vestal 2015). However, to our best knowledge, there is no empirical research examining the influences of composition of physical workspaces at the team level. This may explain recent management experiments opposite mobile/tele-working modes: to understand and leverage the influences of different physical workspace settings for virtual team performance, which is what this research aims to answer.

To fulfill the research gap, we proposed a novel research model based on personal construct theory and integrative complexity theory to examine 1) what are the influences of composition of private (e.g., home) and public workspace (e.g., hotel lobby or airport) on virtual team creativity? 2) whether and how do team socio-cognitive processes (i.e., task conflict and relational conflict) mediate these influences? We will conduct a controlled lab experiment to answer these questions. We expect this study will contribute to both theory and practice as this is the first exploratory study on the composition of physical workspaces on virtual team creativity. In addition, we aim to enrich virtual team literature through investigating the material aspects within the virtual context. Furthermore, we attempt to provide a comprehensive understanding on the underlying socio-cognitive mechanism of translating workspace composition at the team level, offering new insights on how to improve performances of virtual teams and leverage the influences of private and public workspaces. We expect those results will shed light on organizational arrangements of team composition in response to increasing globalization and virtuality in business world.

Theoretical Background

Private and Public Workspaces of Virtual Teams

Physical environment, broadly refers to the arrangements of material objects and stimuli, play a central role in shaping and constraining employee attitude, interaction, and behavior (Elsbach and Pratt 2007). Although several literatures stated the situated nature of virtual teams, suggesting that virtual team members remain embedded in locally distinct surroundings (Cramton and Hinds 2004; Rennecker 2002; Sarker and Sahay 2004), little research empirically investigated this at the team level. Previous studies on mobile work have showed that mobile knowledge works were increasingly working in various places and not tied to traditional offices, calling for implications of configuration and reconfiguration of workspaces (Cohen 2010; Felstead et al. 2005; Hislop and Axtell 2009).
In this study, we focus on the composition of two common types of workspaces in mobile work: private and public workspaces. Although the distinction between public and private is multidimensional (Harden 2000), the degree of physical enclosure provided by the environment is the fundamental characteristic to distinguish types of workspaces (Davis 1984; Oldham and Fried 1987; Elsbach and Pratt 2007; De Been and Beijier 2014). Previous literature in environmental psychology has shown that employees' communication and concentration would be influenced by physical characteristics of environments (e.g., private and nonprivate), but the effects are neither always “good” nor “bad”. Private workspace has been found positively related to satisfaction (Bloom et al. 2015; Brennan et al., 2002; Oldham, 1988), perceived of privacy (Sundstrom et al. 1980) and motivation (Oldham and Brass 1979), which improves workers' concentration and leads to higher performance (Oldham et al. 1991; Sundstrom et al., 1994; Heerwagen et al., 2004). On the other hand, private workspace also presented negative effects such as hindering the collaboration and communication, especially informal or visual communication (De Been and Beijier 2014).

Public workspace presented both positive and negative effects on employees as well. Previous studies showed that the public environment facilitates communication and collaboration due to removing physical barriers or reducing distance (Oldham, 1988; De Been and Beijier 2014). Further, a more public environment may produce a greater perception of task significance which is an important component of job experience (Oldham and Rotchford 1983). However, the perceived crowding and noises would reduce privacy and concentration (Shalley and Oldham 1997; Stokols et al. 2002), and endanger the satisfaction and performance (Oldham et al. 1991; May et al. 2005). Despite the long tradition of concerning physical environments in individuals and co-located teams (see Elsbach and Pratt 2007; Davis et al. 2011, for a more detailed reviews), few studies concerned this aspect in virtual teams.

**Personal Construct Theory and Integrative Complexity**

The situated nature of virtual teams has been proposed but yet understudied in IS field. Several researches suggested that virtual team members remain embedded in locally distinct surroundings (Cramton and Hinds 2004; Rennecker 2002; Sarker and Sahay 2004). As Suchman (1987) argues, human interaction is inherently situated in a particular context that recursively frames and is reframed by the actual practice of action. Thus, the situated physical environments would shape members’ attitudes, interactions, and behaviors (Elsbach and Pratt 2007), ultimately posing influences on the virtual team outcomes.

We therefore draw from personal construct theory and integrative complexity as the conceptual perspectives to investigate the socio-cognitive mechanism of translating the influences of workspace composition in the virtual team context. Personal construct theory is developed by George Kelly (1991) to understand how individuals make sense of their environments, which has been widely applied in fields of strategy (Ginsberg 1990), team coordination (De Vries et al., 2014), and IS research (Tan and Hunter 2002; Davis and Hufnagel 2007). Kelly (1991) stated that individuals use their own beliefs (i.e., personal constructs) to understand and interpret their environments and events that occur around them. As a result, individuals develop a personally organized system of interpretation to anticipate consequences of their behaviors and interpret others’ behaviors. These constructs result from individual experiences that refer to the cycle of framing personal interpretations of the world and reassessing them in light of ensuing events (Ginsberg 1990). Further, personal construct theory is not only an individual theory, but also concerning the role of social processes. Kelly (1991) argued that personal constructs that individuals use to organize interpretations of the world and guide actions are shared by relevant others, which provided foundation of intrateam processes (Walker and Winter 2007).

As an information processor, a team could translate various thoughts that are embedded in members into better decisions or products through a number of socio-cognitive processes (Hinsz et al. 1997). This complexity could be best described by integrative complexity theory. Integrative complexity refers to the team capacity of information processing with two contrasting processes-differentiation and integration (Driver and Streufert 1969). Differentiation involves seeking solutions from different sources of knowledge or different perspectives, while integration refers to the processes of developing interconnections between those perspectives and resolving differences or arriving at some amount of consensus. Integrative complexity has been widely applied in studying idea generation and decision making (Grisé and Gallupe 1999; Chidambaram and Tung 2005). Recent studies have extended the integrative complexity theory into sociocognitive complexity (Ginsberg 1990) or cognitive-affective complexity (Te’eni 2001) to provide a fuller picture concerning both cognitive and relational aspects. As such, personal construct theory and its
predictions regarding socio-cognitive complexity may bear the special relevance to explaining the relationship between physical workspace composition and virtual team outcomes.

**Conflict in Virtual Teams**

A considerable corpus of work has stated conflict in teams as an important team process (Jehn 1995, 1997; Jehn et al. 1999; Pelled et al. 1999). The presence and influence of conflict in virtual teams have attracted considerable attentions as well. Previous model proposed that the nature of virtual teams (i.e., physical distance and technology mediation) would become the hotbeds of conflict and all types of conflict (i.e., task, relational, and process) that would be detrimental to the performance of virtual teams (Hinds and Bailey 2003). However, some researchers suggest that conflict may be not always bad. For instance, task conflict helps members to carefully consider the task-relevant information, but such benefits for team performance or team creativity are contingent on team’s ability to resolve conflict (Jehn 1995; De Dreu 2006). Although the relationship between team conflict and team outcomes (e.g., effectiveness, creativity) seems complex, team conflict has been long focused as an important process to predict team dynamics and outcomes (Jehn 1997; Jehn and Mannix 2001; Wakefield et al. 2008; Windeler et al. 2015).

Literature has mainly identified three types of team conflict: task, relational, and process. Task conflict refers to disagreements on the tasks or work content (Jehn 1995). Relational conflict (also referred as affective or interpersonal conflict) arises when there are interpersonal incompatibilities or disagreements that are characterized by anger, tension, or dislike among members (Jehn 1995; Hinds and Bailey 2003). Process conflict refers to disagreements about “how to do the task or how to delegate resources” (Jehn et al. 1999). As literature also deemed that process conflict is a sub-dimension of task conflict and merely provides a more nuanced view of conflict related to the task (Barki and Hartwick 2004; Windeler et al. 2015). Therefore, this study focuses on task conflict and relational conflict.

**Exploitative and Explorative Task Performance**

Team creativity, refers to the production of innovative and useful ideas by a team of individuals working together (Shalley et al. 2000), is critical to virtual teams’ success (Drazin et al. 1999). Although literature on virtual teams boosted in last two decades, creativity has not received much consideration within this field (Gilson et al. 2015). As team outcomes, the number of unique ideas that team produces has been considered in the context of idea generation (Alnuaimi et al. 2010). Literature also examined the influences of technology (Valacich and Schwenk 1995; Han et al. 2011) and geographic dispersion (Chidambaram and Tung 2005; Gibson and Gibbs 2006; Tzibbar and Vestal 2015) on creativity of virtual teams.

The creativity literature stated the innovative solutions arise from integration of diverse knowledge (Nijstad and De Dreu 2002) through various team processes that allow for creativity and tasks oriented towards creative solutions (Gilson and Shalley 2004). Those activities could be well explained with the twin concepts of exploitation and exploration (March 1991). The nature of exploration was experimentation with new alternatives that leads to novel products and innovative solutions to problems; exploitation was the refinement and extension of existing knowledge, technologies, and solutions (March 1991). Both exploitation and exploration were essential to organizations (March 1991; Jansen et al. 2006), which has been applied to investigating learning and creativity at the level of organizations (Jansen et al. 2006), teams (Ramesh et al. 2012), and individuals (Durcikova et al. 2011).

This study regards virtual team creativity as the performance of creative tasks, which requires teams leverage and integrate various knowledge and information embedded in individuals to generate as many solutions as possible. To distinguish from the traditional routine/nonroutine tasks, we consider two types of creative tasks: the exploitative task and the explorative task, adapted from the twin concepts of exploitation and exploration in organizational innovation literature (Gupta et al. 2006). While we distinguish two types of creative tasks here, both exploitation and exploration can be seen as practices of combining knowledge but differ in the amount of experimenting new ways (Gupta et al. 2006). Accordingly, we will manipulate the amount of existing knowledge of the exploitative task and explorative task, so that team members could build on existing knowledge and solutions for generating new alternative. While the explorative task requires more experimentation and innovation due to the absence of existing knowledge.
Research Model and Hypotheses

The Effects of Private and Public Workspace on Virtual Team Creativity

Over the years, physical environments in management studies refer to the arrangement of material objects and stimuli, and scholars usually apply stimulus-response perspective to investigate the sequential effects of such arrangement (Oldham and Fried 1987; Elsbach and Pratt 2007; De Been and Beijier 2014), and few concerning on revealing the underlying mechanisms. Furthermore, this stream of literature mainly focuses on the context of co-located teams, thus those implications could not be easily extended to the virtual team context. Toward this end, we draw on personal construct theory and integrative complexity theory to investigate the effects of workspace composition on virtual team creativity with a more comprehensive understanding.

According to personal construct theory (Kelly 1991), we argue that constructs developed by individuals in the private workspace are different from ones developed by whom locate in the public workspace. Consequently, individuals in the private (or public) workspace will have different perspectives and show different behaviors from ones in the public (or private) workspace. For instance, individuals in the private workspace are more likely to concentrate on the ongoing tasks or current situations, and construe that they are situated in a relatively private and quiet environment. On the contrary, individuals in the public workspace with less walls or barriers that hindered interpersonal communications are more likely to interact with other people because they construe the environment encouraging interpersonal interactions. These statements are consistent with findings in previous studies indicating that public workspace could facilitate interpersonal interactions in organizations while private workspace could increase individuals’ concentrations (see Elsbach and Pratt 2007; Davis et al. 2011, for more detail reviews).

Per the theory of integrative complexity, we expect that virtual teams with hybrid workspace composition (i.e., members are equally situated in both the private and public workspace) will display better performance in terms of both exploitative task and explorative task than teams whose members are situated in homogeneous workspaces (i.e., merely in private or public workspace) due to increased complexity. Taken together, we hypothesized as follows (see Figure 1):

Hypothesis 1 (H1): In the virtual team context, the relationship between team composition of private and public workspaces and team creativity will be an inverted-U shape, such that

(a) Compared with the ones of homogeneous composition of either private or public workspaces, virtual teams with hybrid workspace composition will display better exploitative task performance.

(b) Compared with the ones of homogeneous composition of either private or public workspaces, virtual teams with hybrid workspace composition will display better explorative task performance.

The Mediating Role of Team Conflict

The presence of conflict in virtual team has been well supported in previous studies (Hinds and Bailey 2003; Hinds and Mortensen 2005), and has been regarded as a crucial mechanism on virtual team performance (Wakefield et al. 2008). Consistent with co-located team conflict literature (Jehn 1997), we expect both...
relational conflict and task conflict are negatively related to virtual team creativity. From the information-processing perspective, relational conflict shows a negative effect on team effectiveness because it inhibits cognitive functioning and also distracts members from the task (Jehn 1997; Jehn and Mannix 2001). The negative feelings and tensions lead team members withdraw from sharing and integration, ultimately leading to suboptimal products (Evan 1965; Jehn 1997). In addition, high levels of disagreements on task content will disrupt the coordination and knowledge integration, thus reducing consensus and hindering knowledge implementation (Jehn and Mannix 2001), which consequently lower the team creativity. Previous studies found that both relational and task conflict were consistently related to worse performance when teams in the virtual context or deal with complex tasks (De Dreu and Weingart 2003; Hinds and Bailey 2003; c; Windeler et al. 2015).

According to the theory of integrative complexity, we expect virtual teams with hybrid workspace composition will display better performance because of lower level of team conflict (i.e., relational conflict and task conflict) than the teams with homogeneous workspace composition. Previous studies found that increased complexity of team inputs would increase team information-processing capacity and motivate teams become more creative and effective (Amabile et al. 1996; Hinsz et al. 1997; Shalley et al. 2004; Wilson et al. 2007). Thus, teams with members in both the private and public workspace could effectively integrate diverse perspective to reach a certain amount of consensus, leading to lower level of task conflict. Based on the cognitive-affective complexity model (Te’eni 2001), teams with high affective complexity would be motivated to resolve different attitudes or tensions with various strategies like “affectivity” and “perspective taking”. Thus, we expect teams with hybrid workspace composition will have lower level of relational conflict compared to their counterparts with homogeneous workspace composition.

We further expect the salience of relational and task conflict will be different in terms of the exploitative and explorative task. Previous studies have found the task type moderated the relationship between team process and team performance (e.g., Jehn 1995, 1997; Stewart and Barrick 2000). A recent meta-analysis further revealed that complex tasks require a number of attention resources and typically require long time duration to perform (De Dreu and Weingart 2003). As argued earlier, both exploitative and explorative tasks require knowledge integration and application but differ in the amount of experimenting new ways (Gupta et al. 2006). Thus, team members would allocate different amount of attentions on task and relationship-related issues in terms of the exploitative and explorative task. Taken together, although both task and relational conflict are negatively related to the performance, we expect task conflict is more salient in performing explorative task compared with exploitative task.

Given conflict is merely one of the important team processes on influencing virtual team outcomes (Gilson et al. 2015), we expect conflict will partially mediate the inverted U-shaped relationship between workspace composition and virtual team creativity. Because hybrid workspace composition may lead to lower levels of both relational conflict and task conflict, which in turn leads to better performance of exploitative task and explorative task, respectively. We hypothesized as follows:

Hypothesis 2 (H2): In the virtual team context, team conflict will partially mediate the inverted-U relationship between workspace composition and virtual team creativity, specifically,

(a) Compared with ones of homogeneous composition, teams with hybrid workspace composition displays a lower level of relational conflict, which consequently has a negative impact on the exploitative task performance.

(b) Compared with ones of homogeneous composition, teams with hybrid workspace composition displays a lower level of task conflict, which consequently has a negative impact on the explorative task performance.

Methodology

Experimental Design

We will design three compositional modes (see Figure 2) which composed of private workspace (i.e., private discussion room) and public workspace (i.e., lobby of an administration building). Three compositional modes manipulate variety of team workspace through manipulating distribution of team members across private and public workspace. In compositional mode 1 (or mode 3), members will be all assigned in public
(or private) workspaces. In compositional mode 2, members will be equally assigned in private and public workspaces. Private and public workspaces will be set in different floors or buildings so that team members cannot communicate face-to-face but exclusively communicate through WeChat, which is one of the most popular instant messaging tools that support group chat.

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Legends: ○ An individual team member in a public workspace (e.g., in a lobby or a cafe). ○ An individual team member in a private workspace (e.g., in a research carrel or a private discussion room).

Figure 2. Three Modes of Virtual Team Workspace Composition

We will recruit participants from a major public university and the experiment procedures are depicted in Figure 3. Once arrived, participants will form four-person teams. The staff will lead participants to make an ice-breaking including brief self-introductions, team-building, and launch a chat group on WeChat for communication and coordination during the experiment. We will ask participants to use their own smart phone which installed WeChat. Then, participants will receive an oral instruction on experimental procedures and requirements based on the printed experiment script. Then the whole team will be randomly assigned to one of the three composition modes in Figure 2. Participants will experience a training task in 5 minutes for being familiar with the game, following is the first questionnaire on perceived openness of situated workspaces (i.e., manipulation check) and training effectiveness. Experiment tasks consist of an exploitative task and an explorative task with 15-minute limit for each. Participants will be required to collaboratively generate as many solutions as possible for each task within the time limit. Finally, they will finish the second questionnaire on perceived conflict during the experiment. Each participant will receive 40 RMB (around 6 USD) in cash as reward.

![Image]

Figure 3. Experiment Procedures

**Experimental Tasks**

Experimental tasks are redesigned from individual assembly tasks to collaboration tasks in a computer game called “Contraption Maker”, which allows multiple players to collaboratively play online. Contraption Maker is the spiritual successor to “The Incredible Machine” produced by Sierra Entertainment in 1993 (Wikipedia 2017), which has been widely used in previous literature to investigate team collaboration, learning and computer-mediated communication (Katz and Te’eni, 2007). In this game, collaborators share the goal of successfully assembling a machine to solve the puzzle. Once assembled correctly, the machine creates a chain effect to generate sequential events and finally achieve the goal.
We took the pre-experimental training as the example to illustrate how team members would perform the task. As shown in Figure 4, four individuals form a team and collaborate on assembling a set of machine parts on four individually assigned computer with a synchronized full-size screen. Team members share the team-based goal of assembling the set of machine parts to get a ball kicked to the destination with a flag. To achieve this goal, team members are able to drag the machine part from left to right, or connect strip to the driving wheel, or to extend the brick to stop the ball. Once activated, the machine parts would trigger sequential events and finally achieve the goal.

In the exploitative task, some machine parts have been introduced and presented in the pre-experimental training, while all machine parts in the exploratory task are new to the participants. Thus, the exploitative and explorative tasks differ in the amount of participants’ learning and utilization of existing knowledge during the solution generation, which is consistent with the definitions (Gupta et al. 2006). Furthermore, for both the exploitative and explorative tasks, we will encourage participants to generate as many solutions as possible within the time limit. However, only successful solutions that differ from previous ones would be counted. They will be informed that there were at least 3 different solutions for each task. Successful solutions will be recorded and notified to participants automatically.

**Measures**

We will measure exploitative and explorative task performance of virtual teams as the number of successful and unique solutions generated by each team when they performed the designated exploitative and explorative tasks, respectively. Measures for relational and task conflict will be adapted from Jehn and Mannix (2001) with a 7-point Likert scale. We will also measure participants’ age, disciplinary information, gender, and prior experience with similar computer games at the individual level, and controlled for average age, disciplinary background diversity, gender diversity, and average experience at the team level during hypotheses tests (Blau 1977; Harrison and Klein 2007).

**Conclusion**

In this study, we intend to investigate the influences of private and public workspace composition on virtual team creativity, i.e., performances of exploitative and explorative task. We will conduct a laboratory experiment to examine the proposed model. This study has the potential to make contributions to both theory and practices. This study will extend literature in virtual teams on examining physical workspaces and team creativity, also sheds lights on understanding roles of relational conflict and task conflict play in mediating those influences. Our findings will provide practical implications for managers who utilizing
virtual team to recognize the situated nature of virtual teams and complexity of leveraging different workspaces to facilitate team performance.

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