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ABSTRACT

Virtual project teams fulfill business strategies and realize business objectives in a competitive business environment. However, these teams work together over a limited period of time across geographical distances and varied time zones, which pose risks on the team's performance as knowledge that is necessary to accomplish crucial project tasks may be impeded. Through information technology, these teams are able to communicate and develop their respective transactive memory systems—a concept known to help teams pool together a collective working knowledge to improve team performance. In addition, trust among team members plays an equally crucial role in the development of transactive memory systems. By presenting a conceptual model and a set of propositions, this study explores the interrelationships between trust, transactive memory systems, information technology and their consequential impacts to team performance in a virtual project context.

Keywords

Virtual project teams, transactive memory systems, trust.

INTRODUCTION

Globalization continues to compel many organizations to constantly evolve their business strategies by leveraging advancements in information technologies (IT). As such, organizations rely upon virtual project teams in order to translate business strategies into actions and realize business objectives (Manu 2007). Virtual[1] project teams (VPT) are characterized to support flexible work assignments and distributed resources that span across geographical distances and varied time zones (Khazanchi and Zigurs 2005/2006; Zigurs et al. 2008). Further, unlike other business teams, project teams work within a definite time frame, and project members may no longer work together again after the project ends (Storm and Janssen 2008). Through collaboration technologies, project teams utilize *knowledge* as a valuable fundamental resource for managing projects effectively (Gasik 2011).

Research has revealed, however, that advances in technology do not necessarily prevent the breakdown of knowledge exchange across distributed sites (Oshri, Van Fenema et al. 2008). The innate characteristics of virtual project teams often ensue many problems and knowledge barriers despite the implementation of strategies to improve productivity via aggregated work-shift patterns (Sole and Edmondson 2002). Yet, the lack or disruption in the flow of knowledge negatively affects project team performance (Gasik 2011; Jarvenpaa et al. 2004). For this reason, studies have drawn the notion of transactive memory systems to help teams pool together a collective working knowledge to improve team performance (e.g., Choi, Lee and Yoo 2010; Kanawattanachai and Yoo 2007). *Transactive memory systems* (TMS) are social constructs by which knowledge processes is developed within groups via a specialized division of labor among team members (Wegner 1987). Integrating TMS as a crucial component of the larger knowledge management systems is a vital competitive advantage for organizations (Ashleigh and Prichard 2012).

However, because knowledge is a personalized, processed information residing in an individual's mind (Alavi and Leidner 2001), team members may tend to show reluctance to share knowledge due to lack of interpersonal trust (Wickramasinghe and Widyaratne 2011). Research reveals that *trust* is essential in stimulating team interactions. In particular, teams whose members exhibit high levels of trust toward each other tend to cooperate and perform better (Porter and Lilly 1996). Further,

[1] The term *virtual* project team is interchangeably used with *dispersed* project teams and *distributed* project teams throughout the text.

teams with high levels of trust are inclined to share knowledge voluntarily, whereas teams with low levels of trust are reluctant to share knowledge openly and avoid opportunities to cooperate with the rest of the team (Politis 2003).

Along the same vein, a few studies have established the relationship of trust with TMS development (e.g., Akgün et al. 2005; Ashleigh and Prichard 2012). Yet, the complexity of trust as a multidimensional construct requires careful scrutiny when applied on virtual team behaviors (Owens 2012). This study, therefore, explores answers to two interrelated questions: (1) *how does trust influence the development of TMS and performance of virtual project teams* and (2) *how does the use of collaboration technologies affect the development of trust within virtual project teams?*

This paper is organized as follows. The next section summarizes the literature on TMS and then followed by a discussion of trust. We then discuss how these concepts could be interrelated by presenting a theoretical model and a set of propositions that explain the relationships between and among trust, collaboration technologies, TMS and virtual project team performance. Finally, we offer our concluding thoughts and identify potential contributions of this research.

THEORETICAL BACKGROUND

Transactive Memory System

Otherwise known as "group mind" (Wegner, Giuliano et al. 1985; Wegner 1987) or "collective mind" (Weick and Roberts 1993), *transactive memory systems* (TMS) are networks or aggregations of individual memory systems. More specifically, TMS offers the ability for any individual of a group to *extend* his or her memory system through another person's memory system (or expertise) within the same group. TMS is formed when two or more individuals form a network of extended memories systems within their group. Communication is the means by which TMS operate and develop. The interconnection of disparate minds enable groups to behave in a structured and systematic fashion beneficial to all members (Wegner 1987).

Understanding how TMS works requires understanding of the following concepts: (1) the difference between internal memory and external memory, (2) the three stages by which information is processed in a memory system, and (3) the two pieces of information required to identify a particular information or memory item. Whereas *internal memory* pertains to the memory residing within an individual's mind, *external memory* pertains to the memory residing in objects or artifacts (e.g. a diary, calendar, smart mobile devices, etc.), or other people's minds (e.g. that of a spouse, an office assistant, etc.) that an individual may utilize to store and retrieve information. Information is processed in a memory system (either internal memory or external memory) by undergoing three different stages: (1) encoding, (2) storage, and (3) retrieval (Wegner, Giuliano et al. 1985; Wegner 1987). In these stages, a memory item (information) is identified by its *label* and *location*. For example, "Bill's address" (the label of an information) may be stored in an address book of a friend's smart phone (the location of information). In the context of TMS, individuals in a group identify other individuals within the same group who might yet be another source of knowledge and expertise who could provide information to answer or solve a group problem. The more known domain experts there are within the group, the higher is the quality of the group's TMS (Wegner 1987).

TMS Impacts on VPT Performance

Choi et al. (2010) found that TMS has a positive direct impact on knowledge processes and an indirect impact on team performance. Ellis (2010) interestingly examined how an increase in acute stress negatively affects TMS, which likewise explained the negative performance of team members. In a similar vein, Liang et al. (1995), as well as Hollingshead (1998), revealed that trainings conducted as a group, in contrast to individual training, showed better group performance in accomplishing tasks. Further, Oshri et al. (2008), and Yoo and Kanawattanachai (2001) have extended these relationships within the context of any virtual teams. These are among the influential studies that provide strong evidence on the positive relationship between TMS and team performance, which may specifically be applied to virtual project teams. As such, we identify the following proposition:

> *Proposition 1: A more developed transactive memory system in virtual project teams will lead to higher levels of project team performance.*

IT Impacts on TMS

Virtual teams heavily rely upon IT to collaborate and perform their tasks. For example, Choi et al.'s (2010) study in part how information technologies used to leverage knowledge processes within teams directly impact the development of TMS. Likewise, Nevo and Wand (2005) claims that IT provides support for overcoming difficulties in places where TMS in groups do not naturally develop. In addition, Griffith et al. (2003), explains that, unless managed with caution, IT used to manage knowledge processes may destabilize employee-organization relations. Seeing that transactive memory plays a crucial role in knowledge processes (Griffith et al. 2003), the potential impacts of IT on TMS are essentially similar when transferred within the context of virtual project teams. From these contributions, we identify the following proposition:

Proposition 2: The use of information technology will lead to a more developed transactive memory system in virtual project teams.

Trust

The ubiquitous nature of *trust* spans across many scientific disciplines (Owens 2012). Despite its many definitions, trust refers to the understanding or expectation that a certain individual will behave honestly, fairly, and reliably to fulfill his or her commitments to another (Cummings and Bromiley 1996). Trust, however, is a multidimensional construct for which researchers are compelled to study trust in multiple perspectives. Trust dimensions (or layers) include: (1) developmental phases, (2) levels, (3) type, and (4) individual trust dimensions (Owens 2012). Owens adds that individual trust is composed of two dimensions: (1) trustfulness, or the disposition to depend on another in a specific situation; and (2) trustworthiness, or the belief that another person is benevolent, competent, and honest.

In this study, we focus on the impacts of trust on the development of TMS and overall VPT performance. In the same vein, we wish to understand the reciprocal effect that TMS may have on the development of trust in VPT. And lastly, we wish to understand how IT impacts the development of trust in VPT. Figure 1 shows the theoretical model that summarizes how all these relationships may interplay. These relationships provide additional propositions we are to discuss in the succeeding sections.

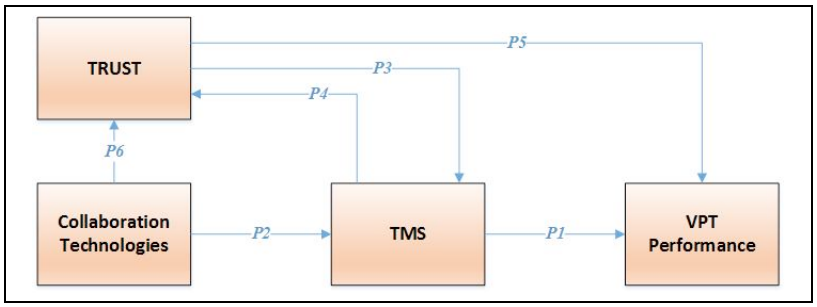

Figure 1. Theoretical Model: Role of Trust on TMS Development and VPT Performance

Relationships between Trust and TMS Development

Ashleigh and Prichard (2012) modeled the relationship between trust and TMS following Rulke and Rau's (2000) encoding cycle framework, which is illustrated in four stages. At stage 1, declarations of knowledge or expertise by team members would be influenced by trust depending on a member's degree of perception of trustworthiness towards another team member. Assuming there are no preconceived notions about anyone in the team, team members have to trust and rely upon the expertise and competence of others. At stage 2, trust would be more influential because team members would have re-evaluated claims of expertise made at stage 1. At stage 3, the team then would allocate responsibilities to specific expertise based on the level of trust that resulted from stage 2. And at stage 4, the outcome performance of tasks (in terms of level and quality) will determine how teams will re-allocate responsibilities based on the reassessed expertise within the team. The cyclic revision of perceptions of trustworthiness, therefore, serves as the organizer of the structure and transactive processes in the knowledge network (Ashleigh and Prichard 2012). By this, we identify two reciprocally related propositions:

Proposition 3: In virtual project teams, higher levels of trust will lead to more developed transactive memory systems.

Proposition 4: In virtual project teams, more developed transactive memory systems will lead to higher levels of trust among team members.

Trust Impacts on VPT Performance

Literature constantly reiterates the central role of trust in any group or organizational setting. This is because trust directly affects socio-emotional as well as task completion aspects of team outcomes such as cohesion, commitment, satisfaction, and team performance (Mitchell and Zigurs 2009). In fact, Porter and Lilly (1996) identifies trust as a key characteristic of high performing teams in that trust improves the quality of group task processes, which consequently, positively affect team performance. Task processes refer to project objectives, prioritization of work, development of work plans, and execution of daily assignments and activities. In a similar vein, Mitchell and Zigurs (2009) have maintains that higher work team trust brings forth higher attitudes of team members to team commitment (Porter and Lilly, 1996), cohesion (Lind 1999) as well as

efficient and effective task performance (Edwards and Sridhar 2005). These findings, therefore, lead us to another proposition:

> *Proposition 5: In virtual project teams, higher levels of trust among team members will lead to higher levels of project team performance.*

IT Impacts on Trust Development

Research highlights the "virtual" nature of virtual project teams as one where communication is an important factor that influences coordination and control across team members in spatially and temporally dispersed environments (Zigurs et al. 2008). Communication is fundamental to building trust (Khazanchi and Zigurs, 2005; Sarker and Sahay, 2002). IT (including collaboration technologies) are purposed to bridge such spatial and temporal gaps. Yet, the nature of collaboration technology continues to be a challenge for virtual teams in several aspects: ease of use of technology, flexibility of technology to adapt to team member dispersion, and "push-and-pull" nature of information (Zigurs et al. 2008). Therefore, by having access to technological tools that promote better communications, trust among virtual project team members are yet enhanced. This leads us to our last proposition:

> *Proposition 6: The use of information technology that promote better communications will lead to higher levels of trust in virtual project teams.*

CONCLUDING REMARKS

This research highlights that, although virtual project teams offer value to organizations, virtual project teams are constantly challenged to process knowledge and perform better because of the teams' inherent characteristics—dispersed, cross-functional and time-bounded. To emphasize, members of project teams work together within a definite time frame, and may not work together again in other projects. With information technology being relied upon to bridge physical and temporal gaps, building trust and developing transactive memory systems within virtual project teams, therefore, are vital components that may help increase team productivity and performance. We have identified six propositions that highlight the integrated central roles of trust and transactive memory systems towards leveraging information technology on improving virtual project team performance. We anticipate that future studies will conduct empirical tests that shall create a viable measuring instrument and validate the propositions presented in this manuscript, in hopes of gaining better insights about virtual project teams as means to increase the likelihood of virtual project success.

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