The Role of Transactive Memory Systems in Managing Software Requirement Phase in Virtual Teams: An Exploratory Study

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ABSTRACT

Software requirement gathering is one of the most challenging phases in an information systems development project, especially when team members are in different countries and communicate among one another in virtual environment. Virtual teams particularly challenge how team members coordinate their knowledge. Literature suggests that the concept of Transactive Memory System (TMS) can not only facilitate knowledge coordination but ultimately improve team performance. As an exploratory study, this paper first presents the results based on the interviews conducted at both the US and Indian sites to showcase the issues practitioners are actually concerned during the requirement phase. Then, this paper analyzes and discusses how different components of TMS may be able to help the team manage those issues. This paper concludes with a set of propositions of which we are planning to follow up with a confirmatory study. As a contribution to both research and practice, this study attempts to improve our understanding of how to manage the requirement phase more effectively by applying the well-established theory to the lessons learned from practitioners.

Keywords: Transactive Memory Systems, Software Requirements, Virtual Teams.

INTRODUCTION

Software requirement gathering involves exchanging information and knowledge among different stakeholders such as between clients and vendors about the requirements of the software and representing them in a way that can be transferred to the design phase. Requirement gathering is not only one of the most challenging activities to manage, but also one of the most instrumental phases to the project success (Bhat, Gupta, and Murthy, 2006). The challenges are even more salient, when team members are not only in different countries, but also communicate among one another mainly in virtual environment (Damian and Zowghi, 2003). Emerging as a modern working structure, virtual teams in particular challenge how team members communicate and coordinate their knowledge (Espinosa et al., 2007; Sarker et al., 2002; Wipawayangkool, 2009). Extant literature suggests that the concept of Transactive Memory Systems (TMS), a combination of individual memory systems and interactions among the individuals in the team to
encode, store, and retrieve one another’s specialized knowledge (Wegner 1986), can not only facilitate knowledge coordination, but ultimately improve team performance (Akgun et al., 2005; Lewis 2004; Wipayayangkool, 2009).

The objective of the paper is to explore the role of TMS in managing the challenges existing in the requirement phase. In addition, as an initial exploratory study, this paper aims to use lessons learned from practitioners rather than conventional literature review as the starting point, as we want to ensure that not only are the challenges real, but also research model and propositions are practically valuable.

This paper is organized as follows. First, this paper presents the results based on the interviews conducted at both the US and Indian sites to showcase the issues practitioners are actually concerned during the requirement gathering phase. Then, this paper discusses the concept of TMS and analyzes how different components of TMS can help the team manage those issues more effectively. Finally, this paper concludes with a set of propositions and future steps, of which we plan to empirically incorporate in a follow-up confirmatory study.

An Exploratory Study

An interview study was conducted to investigate the challenges in outsourced IT projects for US businesses to Indian software developers. The nature of the projects shows that the notion of virtual teams is applied. This was a large project that used the interview study to build grounded theory, and the result was a concept map of the challenges involved in the system of offshore software development between the US and India. The information from that study that is used in this paper is a portion of the larger project, specifically focusing on the requirement gathering phase. The interviews were analyzed and coded. All interviews were recorded and transcribed, and field notes from each interview were documented. From the interview transcriptions and field notes, grounded theory was built using open, axial, and selective coding (Strauss & Corbin, 1990). The following is not a comprehensive list, but merely an excerpt that is relevant to the requirement gathering phase.

Understanding: Software developers must accurately understand the client’s information to be successful. This idea was described by a young developer in India.

*The most challenging thing about that is taking the picture out of the client’s mind. That is the most challenging thing. Sometimes the client speaks a lot and misses the very important part of the project. The biggest challenge is the domain knowledge of the project. Maybe they don’t know a thing about how it’s developed. Sometimes this exists in America but not in India. So we have to have lots of communication with the client and the domain which we are dealing and how the external client interacts with them. That is the most challenging.* (Indian respondent)

Understanding is difficult for a variety of reasons. Clients do not always explain what they want very well.

*It’s very difficult to understand those people. I think that is the main thing, but when we are able to know what exactly we are do, and then we are able to do that thing. But the first thing is to understand what exactly they want, what exactly we have to do with that project.* (Indian respondent)
Participation of Client: The amount of participation that the client has with the development team can help or hurt the communication between the client and the vendor. This concept is included to provide theoretical sensitivity, linking other concepts in the model.

Territorialism within Client Company: According to the respondents of this study, there are a couple of factors that can decrease the participation of the client. One respondent mentioned the fact that protectionism and territorialism can affect the participation of the client, and it can determine how much cooperation some workers in the client organization are willing to give.

“From an IT perspective, there’s certain amount of territorialism or protectionism where they’re looking at their turf and thinking you’re taking away stuff from us, potentially...they don’t say it but it’s there” (US respondent).

Use of Client Mediators: The participation of the client can be increased by using a client go-between. As most workers in the vendor organizations in this study are in India, it is difficult for the US client to directly interact with them as the primary contact. For this reason, all of the respondents in this study used some sort of go-between to handle the interaction with the client using a worker in the US.

So, one of the big challenges is you can get a very talented coder, or developers over, you know in other countries like India, but they are not going to understand the business. They’re not going to understand the end user and the nature and expectations and how the product will be used. Therefore you need someone on this end that needs to be a champion or what we call the product owner, who is working on the project with the remote team in India helping guide them and making sure that they have the information that they need in regard to the end user and the understanding of the business. (US respondent)

Incremental Testing: According to the respondents of this study, incremental testing refines understanding for developers so that they understand the client’s information better. It is possible, even likely, that the vendor developers do not always solve business problems correctly, so catching the misunderstandings early on in development is important. It is much less destructive to the project resources if these things are realized early rather than late.

Research Model and Proposition Development

Based on the abovementioned lessons learned, in this section we turn to analyze those issues by applying the theory of TMS to determine how its components may be able to help the team manage those issues more effectively.

Transactive Memory Systems and Virtual Teams

Wegner (1986) conceptualizes a Transactive Memory System (TMS) as a combination of both a set of individuals’ memories and the interactions among the individuals in the team to encode, store, and retrieve one another’s specialized knowledge. The underlying concept is that with limited memory and knowledge, individuals can use other people’s memories as locations of additional knowledge storage by knowing “who knows what” rather than possessing actual knowledge themselves. As a result, TMS facilitates knowledge coordination by providing team members more efficient access to larger and more complex repositories of individuals’
specialized expertise than each individual’s own memory system (Akgun et al., 2005; Lewis, 2004; Wegner, 1986).

TMS typically comprises three dimensions: specialization, credibility, and coordination (Lewis, 2003). Specialization exists because team members possess specialized knowledge from different domains. Given that team members realize those specializations within the team, they can later develop TMS among one another to exchange desirable specialized expertise. Credibility allows team members to believe that they can rely on others’ knowledge and that others will provide their knowledge into the TMS. Coordination processes among team members occur when they know who has what knowledge and understand how that knowledge can support their tasks. Specialization and credibility reflect the cognitive processes of individuals, while coordination indicates the behavioral state. Some researchers conceptualize TMS slightly differently. Nonetheless, Lewis’s conceptualization (2003) overall covers all the concepts originally proposed by Wegner.

As mentioned, relevant literature suggests that TMS is positively associated with team performance. TMS is crucial knowledge coordination mechanism for team-based projects and even more so for virtual project teams. However, the roles of TMS in virtual teams are rather understudied. Kanawattanachai and Yoo (2007) found that although taking relatively long time to develop, TMS can be formed in virtual teams. They found that the frequency and volume of task-oriented communication are significant in forming TMS in early phases, while task-knowledge coordination is in later phases. Overall, it can be inferred that communication and coordination are important in virtual environment.

Based on the discussion above, we first propose that if virtual team members are well aware of one another’s specializations, they can not only locate, retrieve the knowledge, and improve their understanding of certain domain knowledge more effectively and efficiently, but also know the persons to go to for appropriate mediators or champions of the projects. Secondly, we propose that over time as the team members develop trust and rely on one another’s credibility, they will be less protective of their specialized knowledge and more willing to participate in project activities. In addition, over time, credibility is also expected to improve the team members’ understanding of domain knowledge. Finally, the team members also need to establish how they are supposed to coordinate their task-oriented interactions systematically, as doing so will improve the level of participations among the team members. Particularly, systematic coordination is also expected to increase the frequent delivery of incremental testing of the software. Figure 1 depicts the research model followed by the propositions.
Figure 1. Research Model

P1: The extent to which virtual team members are well aware of one another’s specialization will **positively** influence the extent to which the team members can retrieve and understand domain knowledge.

P2: The extent to which virtual team members are well aware of one another’s specialization will **positively** influence the extent to which the team members can find and know who to go to for the mediators and champions.

P3: The extent to which virtual team members believe in and rely on one another’s credibility will **positively** influence the extent to which the team members can retrieve and understand domain knowledge.

P4: The extent to which virtual team members believe in and rely on one another’s credibility will **negatively** influence the extent to which the team members are territorial with their knowledge.

P5: The extent to which virtual team members believe in and rely on one another’s credibility will **positively** influence the extent to which the team members participate among one another.

P6: The extent to which virtual team members firmly establish how they coordinate their communication will **positively** influence the extent to which the team members participate among one another.

P7: The extent to which virtual team members firmly establish how they coordinate their communication will **positively** influence the extent to which incremental testing is performed.

**CONCLUSION AND NEXT STEPS**

This paper discusses how different components of TMS may be able to help virtual team members manage certain issues in the software requirement gathering phase. Our next steps are to review more literature on the topic, refine the research model and propositions, and empirically test them in a confirmatory study. We plan to develop a construct that embraces those challenges in the requirement phase and use it as a dependent variable. For the TMS, we will adapt the scales existing in literature to match the conditions of the study. As a final note,
our goal is to demonstrate that, by integrating both exploratory and confirmatory approaches it can be assured to a certain extent that the result of the research is applicable to the real world.

REFERENCES


