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Knowledge Transfer in System Development Offshore Outsourcing Projects

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ABSTRACT

Offshore outsourcing has become an alternative for companies to leverage labor resources worldwide and lower cost. Software development is a major activity in offshore outsourcing. To achieve success in software development offshore outsourcing, it is critical to effectively share knowledge between clients and vendors. In this study, based on social capital and intellectual capital theory, we investigate how vendors and clients can effectively share knowledge in software development offshore outsourcing.

Keywords:

Offshore outsourcing, Software development, Knowledge transfer

INTRODUCTION

To globally leverage labor resources, reduce the cost, and integrate diverse knowledge bases, more and more companies start outsourcing their software development to oversea companies (Iyengar, 2004). Shi et al. (2005) describe outsourcing as an activity which *“assemble(s) a diversity of knowledge for more effective and efficient production in order to achieve competitive advantage... Thus, IS outsourcing can be seen as a mechanism to integrate IS knowledge from IS vendors”*. This observation emphasizes the importance of knowledge transfer in IS outsourcing.

Software development is widely considered as a knowledge-intensive process that requires knowledge transfer between clients and the development teams and between team members (Tiwana and Mclean, 2005). Prior research has also shown that knowledge transfer plays an important role in IS outsourcing (Lee, 2001). However, in software development offshore outsourcing, knowledge transfer between clients and vendors is more challenging as ocean-wide separation creates many obstacles for teams to communicate well and develop relationships. Few studies have investigated this issue yet. How to facilitate knowledge transfer between clients and vendors to achieve offshore outsourcing success is the focus of this research. Particularly, we address the research question: What are the factors influencing knowledge transfer in software development offshore outsourcing projects? In this study, we focus on the offshore software project development that involves a single client and a single vendor. The analysis unit is an offshore outsourcing project.

RESEARCH FRAMEWORK

As knowledge is a valuable organizational resource, effective knowledge management can increase business performance and produce long-term competency (Alavi and Leidner, 2001). Knowledge transfer is a process through which "one unit (e.g., group, department, or division) is affected by the experience of another" (Argote and Ingram, 2000). Knowledge transfer in this study refers to the process that the client and vendor exchange and share their knowledge about the project. As software development involves multiple stakeholders (e.g., business users, business analysts, designers, developers, QA, etc.) and each holds specialized knowledge that is needed in the project, a critical activity in software development is to transfer the relevant knowledge to one another so that different expertise can be integrated to ensure the

project success (Tiwana and Mclean, 2005). In software development offshore outsourcing projects, due to the geographic locations of clients and vendors, knowledge transfer between them is extremely critical. The study in outsourcing also reveals that one of the principal obligations for both parties in an outsourcing activity is knowledge sharing, which is positively associated with the outsourcing success (Koh et al., 2004). In a software development process, the client expects that the vendor can provide the necessary skills, information, and expertise associated with understanding and using the outsourced system or service. The vendor expects to learn industry-specific business process from clients and build domain expertise. Without knowledge transfer, the project can not possibility proceed smoothly and finally reach the goal (Ko et al., 2003). In this study, we define the success of offshore outsourcing as the degree of goal attainment of the contract and the satisfaction of the project. Hence, we argue that intensive knowledge transfer between clients and vendors can lead to success of offshore outsourcing.

Hypothesis 1: Knowledge transfer between clients and vendors positively influence the success of the offshore outsourcing project

Social Capital and Intellectual Capital

Though the importance of knowledge transfer has been long recognized, facilitating knowledge transfer is not implemented without drama. Knowledge is “sticky”, facing various impediments from initial stage toward knowledge application stage (e.g., causal ambiguity, unreliability, lack of motivation, lack of capacity, and arduous relationships) (Szulanski, 1996). Knowledge transfer between clients and vendors in offshore outsourcing is usually more problematic due to the distributed nature of the project (Herbsleb and Mockus, 2003).

Nahapiet and Ghoshal (1998) developed a research framework that describes how social capital facilitates the creation of intellectual capital. Social capital theory proposes that social networks provide valuable resource in conducting social affairs such as creating intellectual capital. Intellectual capital is defined as “the knowledge and knowing capability of a social collectivity, such as an organization, intellectual community, or professional practice” and can be created by exchanging and combining knowledge in organizational units (Nahapiet and Ghoshal, 1998). Intellectual capital theory focuses on the social mechanisms to facilitate intellectual exchange at organization and organizational unit level. This focus on social aspect and its influence on knowledge transfer is crucial in knowledge management (Szulanski, 1996).

The catalyst role of social capital in developing intellectual capital can be viewed from three dimensions --- structural, cognitive and relational dimension (Nahapiet and Ghoshal, 1998). These three dimensions of social capital affect the four processes to create intellectual capital:

- Access for combining and exchanging intellectual capital
- Anticipation of value through combining/ exchanging intellectual capital
- Motivation to create intellectual capital
- Combination capability

In software development offshore outsourcing projects, stakeholders of the knowledge are remotely located. This distributed environment poses serious challenges in creating and maintaining social capital, which hinders effective knowledge transfer between teams. Based on social and intellectual capital theories, we investigate the factors impacting the knowledge transfer in offshore outsourcing from the structural, cognitive and relational dimensions.

Based on the social and capital theory, we develop a research model to investigate the knowledge transfer in software development offshore outsourcing (see Figure 1).

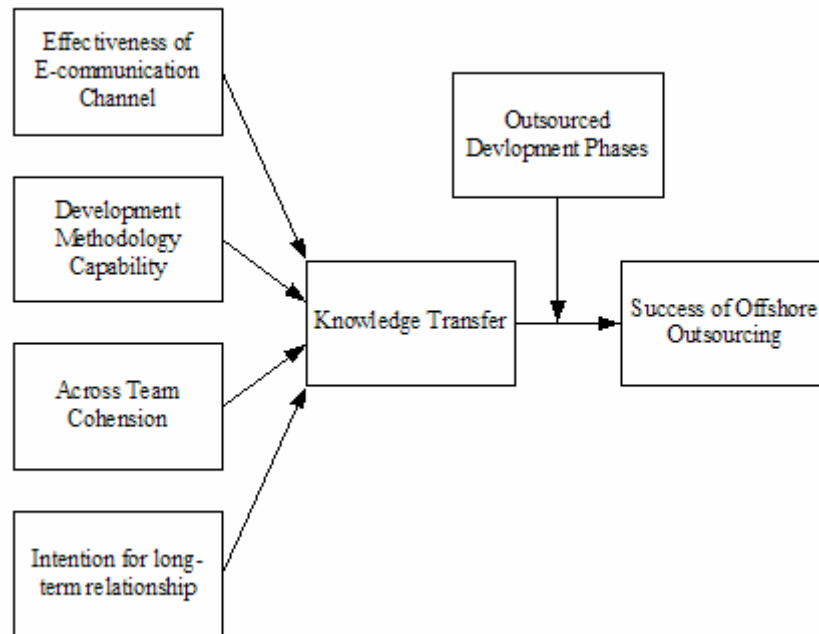


Figure 1. Research Framework

Structure Dimension: The Effectiveness of Electronic Communication Channels

Structure dimension mainly focuses on the network ties that facilitate access to intellectual capital. Intellectual capital here can be either codified knowledge assets or individual tacit knowledge. This dimension emphasizes the importance of the opportunities to access the source of knowledge since it is the first condition for knowledge transfer (Nahapiet and Ghoshal, 1998). Literature on knowledge transfer also argues that effective knowledge transfer depends on effective, frequent communication between numerous individual (Szulanski, 1996). Characteristics of communication channel are taken as an important element influencing learning (Sussman and Siegal, 2003).

Distributed software development, e.g. offshore outsourcing, faces serious communication problems due to the distance between the teams (Herbsleb and Mockus, 2003). Generally, face-to-face communication is more effective in terms of communication and knowledge sharing (Brown and Duguid, 1991). However in remote collaboration, face-to-face communications are greatly restricted by time, locations and expenses (Rice, 1994). What's more, Zmud (1983) found that trips to the fields may be ineffective in promoting system innovation in organizations.

Nowadays, people rely more and more on e-communications such as online document, email, conference call and messaging. E-communication significantly reduces the need of face-to-face interactions (Sussman and Siegal, 2003). In this study, the effectiveness of electronic communication channels refers to the effectiveness of information exchange between vendors and clients using electronic communication channels such as email, instant messaging, tele-conference, etc. The electronic communication channels act as the network bridge to provide the valuable and timely access for one person to the knowledge held by the persons at the other part (Nahapiet and Ghoshal, 1998).

Although previous studies show that e-communication media might not be positively associated with good performance (Rice, 1994) and that the restriction of communication media (e.g. only by computer) increases the difficulty to finish a task (Galegher and Kraut, 1994), we believe that the advanced technology used today can make electronic communications more convenient and useful in remote collaboration than before. Recognizing the importance of e-communication channel and challenges, we argue that the effectiveness of electronic communication channels is one of the critical factors influencing knowledge transfer.

Hypothesis 2: The effectiveness of e-communication channel between clients and vendors positively influences knowledge sharing.

The Cognitive Dimension: Software Development Methodology Capability

The cognitive dimension of social capital emphasizes the importance of shared representations and interpretations among parties involved in a social activity (Nahapiet and Ghoshal, 1998). Shared norms not only help to codified information into categories and provide framework for observing and interpreting social phenomena, but also provide necessary knowledge overlap between parties to encourage knowledge combination and creation (Bechky, 2003; Nahapiet and Ghoshal, 1998).

In this study, software development methodology refers to the capability of vendors to establish and implement methods and processes, and to engage the client for the project. Software development methodologies define the norms and standards that need to be used and followed in a software project, which includes the documents, expected outputs, the notations used in various documents, and development process. The development method is a critical factor to improve shared understanding in software project. It can provide clearly guidelines and rules to facilitate knowledge sharing and avoid confusions and miscommunication. Levina and Ross (2003) confirmed that in software project outsourcing, vendor with high methodology capability (such as CMM 3) can effectively formalize the methodology practices and successfully engage various stakeholders in the development process.

Hypothesis 3: The software development methodology capability of vendors positively influences knowledge sharing.

Relational dimension: Cohesion across Teams and Intention for Long-term Relationship

Relational dimension emphasizes the importance of team cohesion and team culture (Nahapiet and Ghoshal, 1998). It proposes to increase team trust, obligation, and identification to motivate knowledge sharing.

Across team cohesion refers to the extent of reciprocity and closeness of working relationships between the client and vendor. Evidence has shown that one of the important barriers to knowledge transfer is the arduous relations between the knowledge source and the recipient (Ko, et al., 2005; Szulanski, 1996). Knowledge transfer, especially tacit knowledge transfer, requires numerous individual interactions. Successful knowledge transfer depends on the intimate relationship between the source and recipient of knowledge. Research reports that closer relationships result in more frequent and relevant information exchanges (Lee and Kim, 1999). Teams with low cohesion have arduous relations between members, which imposes extra barrier to knowledge transfer.

In distributed software development projects, e.g. offshore outsourcing, people are less likely to perceive themselves as part of the team than those who are at the same site (Herbsleb and Mockus, 2003). Therefore, the average communication frequency between team members drop dramatically compared with traditional projects. In addition, cultural difference in the two countries also makes the responses of team members at each side to software development collaboration vary a lot. Teams at Asian countries may be more likely to work together than the teams in the Western countries, as individualism is weaker and power of leadership is more respectful in Asia. Improving recognition of membership in a group and team cohesion can increase the concerns for group work, thus increasing the chances of knowledge transfer.

Hypothesis 4: The cohesion across teams positively influences the knowledge transfer.

Knowledge transfer needs motivations (Ko, et al., 2005). Two conditions for knowledge exchange and combination are: first, participants must expect activities to create value; second, participants need to feel that engagement in the exchange activities must be worthwhile (Nahapiet and Ghoshal, 1998).

The relationships between clients and vendors in outsourcing can be classified as transactional relationship which is contract oriented, and partnership relationship which involves risk and benefit sharing (Lee, 2001). We believe that the intention to set up the long-term collaboration will increase the knowledge exchange. Intention for long-term relationship refers to the intentions that clients and vendors want to build the long term collaboration relationship. Extensive inter-firm learning and opportunities for knowledge creation play a prominent role in the exploration of outsourcing relationships (Shi, et al., 2005). The intention to build long term relations will encourage more information sharing, effective communication and joint action between two parties (Lee and Kim, 1999). Desire for a partnership in the outsourcing activities can significantly increase the knowledge transfer between the two parties since potential future values can be expected from sharing activities.

Hypothesis 5: The intention of long-term relationship positively influences knowledge transfer.

Moderator: Outsourced Development Phases

Outsourced development phases refer to the software development phases that are outsourced. A software development offshore outsourcing project can be at one of these phases: system analysis, system design, implementation, testing and conversion. Along these phases, the degree of knowledge transfer varies.

In system analysis and design, the understanding of the system is usually vague and unstable. Vendors and clients need numerous interactions to clarify confusions. Clients need to clearly articulate functional requests and vendors need to turn business requirements into technical design. The vendor team learns from clients about business processes and understands more about the requirements. System development literature has stated that client-vendor knowledge sharing, particularly in the system design process, is positively associated with project success (Wastell, 1999).

In the implementation phase, the communications generally fall among developers at one side. Typically, the system has been well-design and documented. The interactions between clients and vendors drop. In the system testing stage, the knowledge transfer may not be as significant as the other stages. Most of the work is done at one side (either vendor or client side). Therefore, we propose

Hypothesis 6: Different development phases involved in outsourcing will moderate the relationship between knowledge transfer and success of offshore outsourcing.

FUTURE WORK AND CONCLUSION

This research is still in the early stage. We are refining the model and developing instruments. The survey methodology will be adopted to empirically test the research model. We believe this study will contribute both to literature and practices. Though importance of knowledge transfer in offshore outsourcing has been recognized, few studies have explicitly studied the antecedents of knowledge transfer. Our study uses social and intellectual capital theory framework to investigate the main factors influencing the intensiveness of knowledge transfer in a software development offshore outsourcing project. It can help both vendors and clients have a better understanding on the knowledge transfer process.

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