Constitutive Roles Of External And Internal Information Systems For Effective Interorganizational Knowledge Transfer: A Dyadic Approach

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CONSTITUTIVE ROLES OF EXTERNAL AND INTERNAL INFORMATION SYSTEMS FOR EFFECTIVE INTERORGANIZATIONAL KNOWLEDGE TRANSFER: A DYADIC APPROACH

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Abstract

In this paper, we attempt to investigate the constitutive roles of external and internal information systems for interorganizational knowledge transfer which is compassed by the knowledge movement from a source firm and knowledge receipt by a recipient firm. We take a dyadic approach to examine how the interorganizational systems (IOS) and the internal organizational memory information systems (OMIS) enhance the knowledge transfer in a source-recipient dyad. On the one hand, the interorganizational systems initiated by the source firm constitute its social capital that supplies motives for the source firm to send knowledge to the partners, thus activating knowledge movement. On the other hand, the internal organizational memory systems of the recipient constitute its potential absorptive capacity and therefore determine the degree of knowledge receipt. Thus, IOS and OMIS jointly contribute to the effectiveness of interorganizational knowledge transfer with the interventions of the source firm’s social capital and the recipient firm’s potential absorptive capacity, respectively. Implications of this research will be salient to interorganizational relationship management and knowledge management.

Keywords: Knowledge transfer, Interorganizational systems, Organizational memory, Social capital, Absorptive capacity, Dyad.
1 INTRODUCTION

In a globally interconnected society, firms increasingly recognize the importance of interorganizational learning within a network, in which firms are provided with access to knowledge, resources, markets or technologies. Knowledge transfer via interorganizational relationships will link the firms to organizational competitiveness gaining and sustaining. A growing body of empirical research has shown that a firm may substantially improve its productivity (Argote and Ingram 2000) and innovative capacity (Szulanski 1996) through the transfer of knowledge both within and across organizations. Interorganizational knowledge transfer includes two critical elements: knowledge movement, i.e., knowledge is transmitted from the source to the recipient, and knowledge receipt, i.e., knowledge is internalized and applied by the recipient. Realizing benefits from new relationships hinges on the success of knowledge transfer between organizations. However, successful knowledge transfer is not always easy to achieve because firms may not share knowledge they possess with others (Stasser and Titus 1987). Furthermore, knowledge has been found sticky and contextualized, therefore it may not be easily transferable (Szulanski 1996, 2000).

Information systems (IS) have been recognized and proved critically important in managing knowledge (Alavi and Leidner 2001). Information technologies accordingly play an enabler role by supporting the channels of transferring knowledge, such as EDI, collaboration technologies (e.g., Lotus Notes, email/voice mail, tele/videoconference, etc.), organizational memory systems, and technologies for representation and interpretation (Alavi and Leidner 2001; Bolisani and Scarso 1999; Huber 1990). More organizations turn to interorganizational learning initiatives and technologies (Liu et al. 2010), trying to utilize the advanced technologies to improve interorganizational knowledge transfer. Meanwhile, organizations also emphasize developing internal information systems for a higher level of knowledge assimilation and absorption. But, simply saying that one or a group of particular technologies facilitate knowledge transfer may not lead us to well understand the underlying mechanism how IS enhance the complex interorganizational knowledge transfer. Prior research on interorganizational relationship usually focuses on one side of knowledge transfer, either knowledge sender or knowledge recipient, thus leading us to an incomplete understanding of knowledge transfer between organizations.

According to the adaptive structuration theory (DeSanctis and Poole 1994) and technology appropriation (Orlikowski and Robey 1991; Orlikowski 2000), information systems have an attribute of dualism, i.e., the constituted nature and the constitutive role. The constituted nature means that the information systems are purposively designed and their functions are fixed as the design completes, while the constitutive role of IS is derived from the interactions between IS and the users during which IS constitute an emergent social structure among individuals, groups, or organizations. Ranson et al. (1980) regard technologies as one contextual enablers and constraints that warrant certain organizational reactions. In respect to the constitutive role of IS, this research attempts to reveal the invisible social structures and capabilities enabled by the interorganizational systems and internal systems to explain how the external and internal IS complementarily contribute to the successful interorganizational knowledge transfer from a focal firm to a recipient firm.

2 RESEARCH FRAMEWORK

There are several perspectives of defining knowledge transfer. From a simple exchange approach, knowledge transfer is defined as dyadic exchanges of organizational knowledge between a source and a recipient unit in which the identity of the recipient matters (Szulanski 1996). From the resulting changes to the recipient perspective, knowledge transfer can be considered as a process through one unit (e.g., firm, group, department, or division) is affected by the experience of another (Argote and Ingram 2000). Knowledge transfer manifests itself through changes in knowledge or performance of
the recipient unit, namely knowledge receipt (Levin and Cross 2004). Ko et al. (2005) captured both facets of knowledge transfer, deviding it into knowledge movement and knowledge receipt. Following the comprehensive conceptualization of knowledge transfer, we defined the interorganizational knowledge transfer as a process that includes knowledge movement from a source to a recipient as well as knowledge receipt in which the recipient learn and apply the knowledge. In specific, knowledge movement is the transmission of knowledge from the source (i.e., a focal firm) to the recipient (i.e., a partner firm). Knowledge receipt refers to the extent to which knowledge has been learned or applied by the recipient. Knowledge is taken to be transferred when learning takes place and when the recipient understands the intricacies and implications associated with that knowledge so that the recipient can apply it (Argote 1999; Darr and Kurtzberg 2000). Three indicators can be used to measure the knowledge transfer, including breath (i.e., the diverse areas related to interlinked business activities in the knowledge transfer), quality (i.e., the timeliness, accuracy, relevance, and value of knowledge transferred, and specificity (i.e., confidential and exclusive knowledge transferred so that provides the recipient a unique perspective).

Consider knowledge movement initiated by a focal firm while knowledge receipt occurring in the partner firm, the effective knowledge transfer is affected by the technological and social structures at both sides of a source-recipient dyad. For the focal source firms, the interorganizational systems (IOS) are usually initiated for developing extensive interorganizational social capitals with partners and thus improving the knowledge movement from the source to the recipients. For the partner recipient firms, the organizational memory information systems (OMIS) matter to their absorptive capacity development that affect the degree of knowledge can be received by the recipients. Thus, this research takes the constitutive role of information systems for organizations and proposes the social capital and absorptive capacity as interventions that bridge the effects of the aforementioned two types of information systems on knowledge movement and knowledge receipt, respectively. The interorganizational knowledge transfer becomes effective when the knowledge movement and knowledge receipt matches in the source-recipient dyad. A research framework is shown in Figure 1.

![Research Framework for Interorganizational Knowledge Transfer](image)

**Figure 1. A Research Framework for Interorganizational Knowledge Transfer**

### 3 INTERORGANIZATIONAL SYSTEMS AND SOCIAL CAPITAL: FROM THE KNOWLEDGE SOURCE PERSPECTIVE

#### 3.1 Interorganizational Systems Constitute Interorganizational Social Capital

Interorganizational Systems (IOS) are planned and managed ventures to develop and use IT based information exchange systems to support collaboration and strategic alliances between otherwise
independent parties (Kumar and van Dissel 1996). IOS facilitate knowledge exchange between participants who pursue for close communication and cooperation. IOS not only enhance the information processing ability of the knowledge sourcing firms, but also increase the information availability for the recipient firms (Premkumar 2000). Prior research has outlined a number of the instrumental benefits of IOS initiatives, such as the economy of scale, specialization, rationalization, increased resource utilization, neutralized competition, and etc. (Kumar and van Dissel 1996). But, the economic stance of IOS impact is not sufficient to consummate the collaborative alliance. The essential impact of IOS should relate to the enhanced interorganizational relationship and the intangible change of interorganizational relationship structure, e.g., interorganizational social capital.

**Social capital** represents the relational resources embedded in a social structure attainable by individual firms through networks of social relationships (Coleman 1990; Lin 2001; Tsai 2001; Inkpen and Tsang 2005). Nahapiet and Ghoshal (1998) have considered social capital as a broadly defined multi-dimensional construct including (1) a structural component, which manifests itself in attributes of the firm's network position and tie strength; (2) a cognitive component, which reflects the shared understanding and problem solving; and (3) a relational component, which encompasses the trusting relationship and the reciprocity norm. Social capital can contribute to the creation of new value for organizations in many ways.

In specific, the constitutive role of IOS to interorganizational social capital and further to knowledge transfer, is due to the IOS infrastructure capability. The primary tangible resources of IT infrastructure include platform technology, network and telecommunication technologies, data and data-processing applications, while the IT compatibility, connectivity, and modularity of IT reflects infrastructure capability (Duncan 1995; Byrd and Turner 2000). Accordingly, the IOS infrastructure capability is shape by the **IOS platform compatibility, IOS network connectivity, and IOS applications modularity.**

**IOS platform compatibility.** Compatibility is the ability to share any type of information or applications across any technology component. To establish the compatible IOS platform for knowledge sharing and transfer across organizations, adopting the industrial rules and standards for IOS configuration is critically important. Clemons and Row (1992) argues that standards facilitate transferability of applications, reducing sunk costs and switching costs and support conversion and translation of protocols and interfaces at a low level of cost. Malhotra et al. (2005) assert that the compatible IOS can enhance the interorganizational relationship in two ways. First, compatible IOS can enhance structural capital of the focal firms because it allows the focal firms to quickly and easily link to their potential partners and gain a advantageous position in the network. Second, compatible IOS can reduce the cognitive load for the interconnected organizations and increase their shared understanding of problem solving.

**IOS network connectivity.** IOS network connectivity refers to the extent to which the IOS of a focal firm can connect to multiple parties. IOS can help the focal firm to establish one-to-many or many-to-many relationships. These IOS enabled network relationships constitute a salient aspect of structural capital of the focal firm. In such a network with a large number of partners enable the focal firm to expand its scanning space and develop close relationships with many partners. The embedded interactions in the IOS enabled network connectivity foster the trusting relationships and reciprocity norms between the focal firms and the recipient partner firms (Hassen 1999; Saeed et al., 2005).

**IOS applications modularity.** Modularity is the ability to add, modify, and remove the modules of software applications with little or no major effect on the applications collectively (Byrd and Turner 2000). The data and software components are subsumed into infrastructure as they become technically standardized, sharable, and reusable in a variety of business implementation. Well-defined modularity in IOS will isolate the most idiosyncratic functional elements and reduce the cost of tailoring systems to new situations, therefore the applications modularity of IOS can help the focal firm to develop trusting relationships and a norm of cooperation with most of the connected partners (i.e., knowledge recipients). Furthermore, the expertise embedded in a modularized IOS infrastructure is codified and...
can be transferred to new applications at virtually no incremental cost (Clemons and Row 1992), which is beneficial for the cognitive capital development of the inter-connected organizations.

Taken the above together, we hypothesize that:

**Hypothesis 1a:** The IOS platform compatibility of the focal firm has a positive impact on its social capital development during the knowledge transfer.

**Hypothesis 1b:** The IOS network connectivity of the focal firm has a positive impact on its social capital development during the knowledge transfer.

**Hypothesis 1c:** The IOS application modularity of the focal firm has a positive impact on its social capital development during the knowledge transfer.

### 3.2 Interorganizational Social Capital and Knowledge Movement

**Structural capital.** The structural dimension of social capital involves the pattern of relationships between the network actors. Social network theorist have focused much attention on structural properties of networks, such as the tie strength at the dyadic level (Granovetter 1973; Hansen 1999; Livin and Cross 2004), and network positions at the network level (Krackhardt 1992; Reagans and Zaheer 1999). At the dyadic level, the interorganizational structural capital is shaped by the **tie strength** of the two interrelated firms, which refers to the closeness and interaction frequency between the two firms. Social ties deal with the specific ways the actors are interrelated and create opportunities for social capital transactions, thus social ties facilitate interorganizational interactions and provide channels for knowledge transfer. Strong ties are important for a focal firm sending knowledge to the partners (Inkpen and Tang 2005). In the absence of strong ties, the source side of the knowledge transfer dyad may not develop the necessary relationship that is pre-condition of the occurring of knowledge movement. Kale et al. (2000) have found a positive relationship between the tie strength and interfirm learning. Ghoshal et al.’s (1994) research on MNCs has also shown the importance of the close relationship for diffusing and transferring new ideas.

**Cognitive capital.** The cognitive dimension of social capital represents the resources that make possible shared understandings and representations between the parties (Nahapiet and Ghoshal 1998). The resources of cognitive capital include the **shared values** and the **shared language and codes**. First, the **shared values** embody the collective goals and aspirations of the dyad and allow the source and the recipient have similar perceptions as to how they should interact with each other, thereby, removes the barriers of understanding and promote exchanges of ideas and resources. The similar heuristics between a source and a recipient will facilitate the knowledge transfer (Hansen 1999; Darr and Kurtzberg 2000). Second, engaging in a meaningful transfer of knowledge requires the **shared language and codes**, which provide a common conceptual apparatus for evaluating the likely benefits of knowledge transfer (Nahapiet and Ghoshal 1998). The lack of shared vocabularies and frames of reference in the dyadic firms inhibits knowledge movement from source firms to the recipient firms (Szulanski 1996).

**Relational capital.** Relational capital exists when **reciprocity norms** forms and **trusting actions** occur in the interrelated organizations (Putnam 1993). The **reciprocity norms** emphasize cooperation and collaboration among organizations, rather than domination, power, and control (Oliver 1990). The reciprocity norms increase the knowledge senders’ confidence that the recipients will be willing to assist them when they find themselves in a similar position (Uzzi 1997). Also, the reciprocity norms can limit a potential negative effect of successful knowledge transfer, i.e., competition, which restricts the specific knowledge movement from the focal firms to the recipients (Szulanski 1996; Argote 1999). A **trusting interorganizational relationship** reflects the willingness of the trustor vulnerable to the actions of the trustee based on the expectation that the trustee will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party (Mayer et al. 1995). The trusting relationship in a dyad can enhance their social exchange and cooperative interaction (Ring and Van de Ven 1992; Riggins and Mukhopadhyay 1994; Ke et al. 2009). thus
promoting interorganizational learning and knowledge transfer (Hamel 1991). On the opposite, the arduous relationship is a critical barrier of knowledge transfer (Szulanski 1996; Ko et al. 2005). Kotabe et al.’s (2002) research highlights the role of relational capital for knowledge transfer, demonstrating that time-bounded relational capital facilitate the higher-level technological knowledge transfer while the arm-length relationship can only support simple technical skill transfer.

Taken the above together, we hypothesize that:

**Hypothesis 2a:** The structural capital of a knowledge source-recipient dyad (i.e., tie strength) has a positive impact on the knowledge movement from the source firm to the recipient firm.

**Hypothesis 2b:** The cognitive capital of a knowledge source-recipient dyad shaped by their shared value and shared language and codes has a positive impact on the knowledge movement from the source firm to the recipient firm.

**Hypothesis 2c:** The relational capital of a knowledge source-recipient dyad shaped by the formation of reciprocity norms and trusting relationships has a positive impact on the knowledge movement from the source firm to the recipient firm.

4 **ORGANIZATIONAL MEMORY AND ABSORPTIVE CAPACITY: FROM THE KNOWLEDGE RECIPIENT PERSPECTIVE**

4.1 Organizational memory information systems constitute the potential absorptive capacity

Organizational memory is the means by which knowledge from the past can be utilized to understand and influence present activities, and Organizational memory information systems (OMIS) actualize the functions of organizational memory (Stein and Zwass 1995). Organizational memory affect how a firm learns from others, as learning problem involves the recipient filtering the knowledge from the source, interpreting the knowledge from its own frame of reference, and learning from a selected group of knowledge holders. The potential absorptive capacity of a firm, including its knowledge acquisition and assimilation, directly influence the extent to which a knowledge recipient can actually learn from the source firm (Cohen and Levinthal 1990). Thus, the impact of OMIS on knowledge receipt from the recipient side can be intervened by the firm’s potential absorptive capacity. The internal systems of the recipient affect the extent to which a firm recognizes and evaluates the usefulness of knowledge transferred by the focal firm and the extent to which a firm can internalize the knowledge. Malhotra et al (2005) postulate that the IT enabled organizational memory and interpretation significantly affect the potential absorptive capacity of a firm.

Organizational memory is an instance of collective memory, which has been parsed into the process of acquisition, retention, search and retrieval of knowledge (Stein and Zwass 1995). Accordingly, the constitutive role of OMIS to interorganizational knowledge transfer is reflected in the capacity of knowledge storage, the mode of interpretations and representations for the interorganizational activities.

**Interorganizational relational knowledge storage.** The knowledge storage about interorganizational relationships shapes the firm’s reservoirs of collective insight, beliefs, behavioral routines, procedures, and policies in interorganizational management (Day 1994; Walsh and Ungson 1991). The knowledge storage for the interorganizational activities is about the interactional knowledge across firms, e.g., communication, negotiation, conflict management, and development and implementation of cooperative programs. Due to the path dependency of organizational behavior, the knowledge storage consisting of a firm’s historical interactions influences the extent to which the firm recognize, acquire and assimilate the knowledge sent from the external firms.

**Interpretations and Representations.** Knowledge receipt not only depends on the mental model of the individual firm for interpretation but also the representations where knowledge is given with common
meanings in the dyad. In the interorganizational relationship, the interpretations and representations of the interfirm activities shape the way a firm evaluate the transferred knowledge from the source outside. First, the use of IT-based interpretation systems enables knowledge obtained from the external source to be organized, rearranged, and processed, and facilitates the receipt of knowledge. Malhotra et al.’s (2005) study empirically demonstrates the significant effect of interpretation systems within a firm on its absorptive capacity and the further organizational performance. Second, OMIS consist of the historical interactions across firms. The history representations can also influence the recipient’s absorptive capacity and the sequent knowledge receipt. Hwang and Salvendy’s (2005) empirical study has shown that an ontology display with history representation affects the effectiveness of an organization’s learning from external sources.

Taken the above together, we hypothesize that:

*Hypothesis 3a*: The interorganizational relational knowledge storage in the recipient firm’s OMIS has a positive impact on its development of potential absorptive capacity.

*Hypothesis 3b*: The interpretations and representations in the recipient firm’s OMIS has a positive impact on its development of potential absorptive capacity.

### 4.2 Absorptive capacity and Knowledge receipt

The absorptive capacity of a firm refers to its ability to value, assimilate and apply new knowledge (Cohen and Levinthal 1990). Zahra and George (2003) reconceptualize absorptive capacity as a dynamic capability embedded in a firm's routines and processes, distinguishing potential absorptive capacity (i.e., ability to acquire and assimilate knowledge) from realized absorptive capacity (i.e., ability to transform and exploit knowledge). Potential absorptive capacity makes the firm receptive to acquiring and assimilating external knowledge (Lane and Lubatkin 1998), which captures Cohen and Levinthal's description of a firm's capability to value and assimilate external knowledge, while the realized absorptive capacity reflects the firm's capacity to leverage the knowledge that has been absorbed. Therefore, it is the potential absorptive capacity that influences the recipient’s knowledge receipt and the consequent success of knowledge transfer.

**Knowledge acquisition** refers to a firm's capability to identify and acquire externally generated knowledge that is critical to its operations. The components of a firm's knowledge acquisition capability include the prior knowledge base, intensity of effort and speed. The prior knowledge base can determine the perceptual schema of a firm's acquisition capability. The intensity and speed of a firm's effort to identify and gather knowledge can determine the quality of a firm's acquisition capability. **Knowledge assimilation** refers to the firm's routines and processes that allow it analyze, process, interpret, and understand the information obtained from external sources (Kim 1997a,b; Szulanski 1996). Chen's (2004) empirical study supports the substantial effect of the potential absorptive capacity on the effectiveness of knowledge transfer, whereas Szulanki’s (1996) empirical study of 122 best practice transfers in 8 firms illustrates that the lack of absorptive capacity is a major barrier of knowledge transfer among the organizational units. Thus, we hypothesize that,

*Hypothesis4a*: The recipient's ability of knowledge acquisition has a positive impact on its knowledge receipt from the external source firm.

*Hypothesis4b*: The recipient’s ability of knowledge assimilation has a positive impact on its knowledge receipt from the external source firm.

### 5 FUTURE RESEARCH PLAN

We have completed the conceptualization of the research framework in which we take a dyadic approach to investigate how the interorganizational systems and the internal organizational memory systems enhance the knowledge transfer from a source firm to a recipient firm. In specific, the IOS
initiated from the source firm constitute its social capital and thus facilitate knowledge movement, and the internal OMIS of the recipient constitute its potential absorptive capacity and therefore determine the knowledge receipt. Thus, IOS and OMIS jointly contribute to the effectiveness of interorganizational knowledge transfer in terms of the breadth, quality and specificity of knowledge.

In the next step, we will adopt or adapt the validated measures in prior research to develop the decent instruments for each construct in our research framework. We will use a survey method to collect data to validate the proposed research model. The knowledge transfer dyad is the basic analysis unit of this research, thus a dyadic approach will be adopted in the survey. We will identify the source-recipient dyad at the interorganizational level and securitize the enablers of knowledge movement and knowledge receipt from the knowledge source and recipient perspectives respectively. We will start to solicit the interorganizational dyads from the side of focal firms and ask the focal firms to indicate their strategic partners. The valid dyad shall show both responses from the focal firm and the partner. We will target the software development industry in China because the interorganizational knowledge transfer is currently active and intensive in this industrial sector. The structural equation modelling techniques (e.g. Partial Least Squares, PLS) can be used to test the relationship when the data are collected.

This research entails important contributions to academia as well as to practitioners. Theoretically, implications of this research will be salient for the research fields of interorganizational relationship management and knowledge management. First, we attempt to investigate the constitutive roles of information systems, IOS and OMIS in particular, for enhancing interorganizational knowledge transfer. Such an investigation will not only confirm one side of the adaptive structuration theory and technology appropriation that argue for the dualism of information systems, but also extend their theoretical application scope to the interorganizational relationship management. Second, we consider both the source side and the recipient side of knowledge transfer and attempt to use a dyadic approach to investigate the effective knowledge transfer at the interorganizational level. To the best of our knowledge, seldom has research adopted the dyadic approach while most of prior research only focus on one side of knowledge transfer. Our approach will help to reveal that the differential capabilities (e.g., social capital and absorptive capacities) should be requested for the focal firms and the partner firms to achieve the effective interorganizational knowledge transfer, making contributions to knowledge management research.

Practically, our research identifies the specific attributes of IOS and OMIS that potentially facilitate the focal firms and partner firms to build up organizational capabilities for knowledge transfer. The identified salient attributes can give IT managers insights to design or deploy appropriate IOS or OMIS in their firms. The deployment of appropriate information systems will enhance the interorganizational relationships when the effective and smooth knowledge transfer can be achieved. Also, our research provides insights for department managers (e.g., marketing department, customer service department, and etc.) of the constitutive roles of the related information systems. The results are expected to help managers understand how IOS and OMIS can help them to transfer knowledge successfully and what kind of capabilities can be developed by adopting the appropriate technologies. We do hope this research with the progress proceeding will provide substantial implications for both focal firms and partner firms to deploy appropriate information systems and develop the relevant capabilities for realizing the interorganizational knowledge transfer effectiveness.

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