

Can Operations Research Inform the Exploitation of Business-to-Business Knowledge Networks?

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WORK IN PROGRESS

Abstract

A conceptual framework originating within the Operations Research literature is presented as a means of informing IMP researchers about how they might better understand and exploit knowledge sharing/transfer in business-to-business knowledge networks. Utilising this framework, preliminary analysis of a recent Indian case study, supports its utility through the identification of facilitators (information systems, mediators) and barriers (distance, organisational) to successful knowledge flow.

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Introduction

The IMP Approach to business-to-business (B2B) networks is well established, from the interaction approach paradigm introduced by Håkansson in 1982, to more recent ideas such as network pictures and schema's (Ford and Ramos 2006; Henneberg, Mouzas and Naudé 2006; Welch and Wilkinson 2002). As researchers criss-cross this area they add to the existing literature through the consideration of new contexts and additional layers of complexity. This results in a large body of literature that analyses B2B networks (characterised by interactions, relationships, actors, activities and resources) in an increasingly broad array of settings.

There is often merit in returning to first principles to provide clarity in understanding the context under investigation. Applying this to the examination of B2B networks, the interaction approach tells us that businesses do not act or operate in isolation, and therefore cannot be understood in such a manner. This results in a range of interactions occurring between the various actors, later articulated by the AAR model (actors, activities and resources). Also within this model is the idea of relationships that facilitate the interactions within the network. These relationships in a B2B setting, as distinct from previous representation, can be classified as close, complex and long term, encompassing extensive patterns of contact between many actors from various organisations within the market (Turnbull, Ford and Cunningham 1996).

Relationships as classified within the IMP literature show that within the network, inter-firm relationships provide a receptacle for combined participant experiences (Turnbull, Ford and Cunningham 1996). These relationships consist of learned rules and norms of behaviour where episodes such as negotiation, social contact and payments occur. This comes together and in turn flows back to influence and be influenced by the relationship. This process continues over time, resulting in mutual adaptation, reduced distance and increased commitment between the various actors within the network (Ford 1982). At the core of these ideas of interaction, relationships and commitment is knowledge. The application and use of knowledge in a B2B context is not new, having previously been discussed in relation to ideas such as knowledge networks in pharmaceuticals, knowledge renewal in banking and of the IMP group itself (Ballantyne 2000; Easton et al 2003; Powell 1998). However, as research into knowledge management and operations research continues to develop, more parallels begin to emerge that suggest new areas of overlap between these areas and B2B networks.

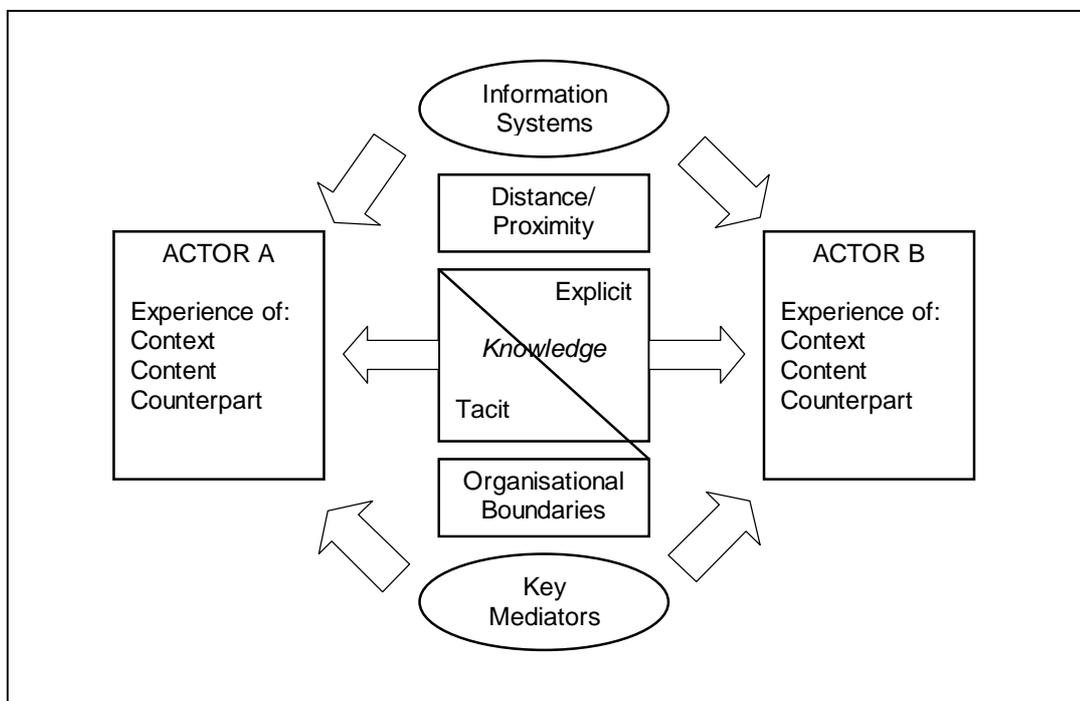
To understand the relationship between knowledge and networks, we must first understand the context. The notion of an organisation as a knowledge creating entity centres on its ability to solve complex and unstructured problems (Nonaka, Toyama and Nagata 2000). Such knowledge creation processes described here are context specific in terms of who participates in them and how, but not in a static sense, more as a dynamic process in which the cognitive individuals are only participants (Beesley 2004).

Beyond the knowledge process, is the knowledge network, which is based on the theoretical perspective of networks representing a set of relationships amongst actors (Lincoln 1982, Seufert, von Krogh, and Bach 1999) akin to the interaction approach outlined earlier. These relationships are developed through the combination of autonomy and interdependence; the coexistence of cooperation and competition as well as reciprocity and stability. Consequently, the knowledge assets of an organisation lie in the nature of the relationships between its members (Stacey 2001). Taking this further, a firm's knowledge resources are derived in significant part from the inter-organisational relationships they maintain and develop in a process similar to the supply-chain management concept of 'managing beyond the firm' (Spring 2003).

The IMP literature tells us that actor, activity and resource interaction and subsequent firm level analysis, results in a degree of adoption, with firms becoming progressively more efficient and effective at working together (Ford 1982; Håkansson 1982; Håkansson and Snehota 1995). Such a transfer of knowledge and ability to 'continually absorb' this new knowledge changes over time and has implications for both explicit and tacit knowledge as it is exchanged between actors during the interactive processes (Cohen and Levinthal 1990)

The question remains whether this intra-inter knowledge transfer (both explicit and tacit in nature) can be effectively promoted and maintained within a B2B network across multi-firms. One attempt to begin to answer this question is shown below in Figure 1.

Figure 1: A model of knowledge management in networks



Source: Adapted from Spring (2003)

Figure 1 is derived from the area of operations research and illustrates a knowledge management process within a network. It shares a number of similarities with the interaction model (Håkansson and Snehota 1995), and reflects a dyadic relationship between two actors within a network and the issues present in the knowledge transfer process. These issues include the nature of the knowledge that is being shared and transferred, the distance and proximity between the actors in the networks, information systems and organisational boundaries that exist in the environment and key mediators and the influence that they hold. Internal factors of the actors are also represented and include experiences around content, context and counterparts.

The use of operations research to try and make sense of knowledge transfer in a B2B network is an emerging link between the two disciplines, particularly with a consensus within operations research of the strategic significance of the inter-firm network (New and Mitropoulos 1995). Traditional focus on individual firms and homogenous markets has been replaced by holistic supply chain thinking and co-operative partnerships within managed networks of suppliers and customers (Gomes-Casseres 1994; Holland 1994; Macbeth and Ferguson 1994)

The acknowledgment that networks of firms can integrate their operations to achieve synergy and competitive advantage signals willingness for more research to be undertaken addressing the applicability of operations research models within the B2B network context. Areas singled out for more research include those of structural morphology (e.g. what would a drawing of a network look like) epistemology, nodes (e.g. firms, business units) and links (e.g. trading links, flows of goods and services, information and knowledge transfer and exchange) (Gomes-Casseres 1994; New and Mitropoulos 1995).

Of particular interest to this research, given this shift in thinking in operations research and the construction of Figure 1, is to investigate the extent to which an operations research framework such as this can form the basis for beginning to understand how knowledge might be exploited with a multi-firm, B2B knowledge network.

Case Study

The firm that serves as the focus of this case study is Larsen & Toubro (L&T) Ltd, a 100 percent Indian-owned conglomerate founded in 1938 by two Danish engineers. The research material was gathered from a series of in depth interviews with representatives from the company in India in February 2006. This material was transcribed and subsequently analysed through an iterative manual coding process checked among several members of the research team to ensure consistency of interpretation.

Traditionally centred on the cement industry, the firm has diversified widely since its inception and has business units in areas such as heavy engineering, electrical and electronics, information technology and machinery and industrial products. The main focus of the company is its engineering and construction projects, which account for 65% of total business (Larsen & Toubro Ltd 2006). The network within which Larsen &

Toubro operates is an extensive one. They have complex multi-site operations with offices in the USA, Europe, the Middle East and in Japan. Moreover, they currently have over 150 collaborative partners across their various interests. Unlike other firms of this nature, Larsen & Toubro invest heavily in this collaborative process stressing the importance of going beyond individual projects (particularly common in the construction industry) to a more longer term view, looking for partners to influence and lead project choice rather than being dictated to.

Larsen & Toubro take the issue of knowledge in their network very seriously. This is particularly evident in their positioning statement looking to the company to rapidly emerge as a “knowledge-based, premium conglomerate with a global reach” (Larsen & Toubro Ltd 2006). Knowledge management is seen as a business specific initiative that encompasses the massive task of integrating the vast resources of explicit and tacit knowledge amongst Larsen & Toubro personnel. To reinforce this message Larsen & Toubro have a range of initiatives that deal specifically with the promotion and maintenance of knowledge management which broadly follow the dyadic model presented in Figure 1. The integrated knowledge management system called *Knownet* has been developed to help Larsen & Toubro and their collaborative partners to assemble their knowledge and experiences. *Knownet* is aimed at harnessing the tacit knowledge and experiences of staff as well as collaborators, in an attempt to ‘capture’ their knowledge assets as described by Stacey (2001) which have been derived from their collaborative experiences (Spring 2003). Tools such as Knowledge on Line (KoL) and Marketing Information Data Access System (MIDAS) are specific examples of ways in which these knowledge gathering processes are undertaken, with KoL in particular, focussed on tacit knowledge functions such as converting personal knowledge to codified organisational and network knowledge, and then leveraging this codified knowledge to deliver business advantages to the customer.

There are several additional examples of how Larsen & Toubro epitomise cutting edge practice in knowledge management/sharing. ‘Domino.Doc’ is a document management system that assists various project teams in storing/sharing explicit knowledge documents from creation to archiving. The ‘Innovation Channel’ is a medium enabling Larsen & Toubro staff to share ideas about what they have seen or read in the areas of emerging technologies and best practice. The ‘Communities of Practice (CoP)’ are project teams practicing in well-defined knowledge domains that assemble in order to capture, create and share relevant knowledge to improve business practice. Lastly, ‘Sametime’ is a software application that enables the sharing of online documents, presentations and instant messaging in an online meeting environment. These ways of dealing with knowledge creation within a large multinational firm reflect the dynamic solutions that need to be developed in order to capture both the participation and outcome elements of knowledge (Nonaka, Toyama and Nagata 2000; Beesley 2004).

An example of how this is being put into practice is Larsen & Toubro’s recent extension of its partnering and collaboration to include a range of New Zealand firms in the areas of oil, energy and earthquake engineering. Historically the relationships that Larsen & Toubro have had with a small number of New Zealand firms had been limited to buying existing products. This has now progressed to a range of formal collaborative

agreements, including New Zealand firms producing products to be sold in India under the Larsen & Toubro brand, as well as ground up development such as collaborative research and development agreements in the oil industry.

The role of knowledge management in these developments has been significant. Notwithstanding the knowledge management focus that Larsen & Toubro actively encourages within its network, existing and potential partners from New Zealand still see it as a barrier to collaboration. This is focused around size asymmetries between Larsen & Toubro and New Zealand partner firms, where issues of intellectual property arise and where culturally, there are marked differences in the prevailing attitudes towards terms of payment – especially when the size of the contracts are so much larger than those the smaller New Zealand companies have ever faced before. The New Zealand firm's insistence on full payment up front and the reluctance on the part of some New Zealand firms to divulge certain information has a direct impact on the sharing of knowledge between those in the network, not only in terms of tacit knowledge, but also in regards to explicit knowledge. This results in the knowledge flow between actors A to B in Figure 1, to break down or to not function to its fullest extent, raising issues of honesty and transparency that need to be considered.

On a more positive note, the experiences of firms that had been involved with knowledge transfer for longer periods of time stated that in general the more the companies interacted, the more successful the relationships became, particularly in terms of trust. Interestingly though, Larsen & Toubro in espousing a mutually-beneficial, long-term relationship orientation does so on a project-specific basis. What interests them and what they feel is more beneficial to their partners and themselves, is to engage in project, or technology-specific collaborative arrangements rather than long-term joint ventures. Because of the high tech nature of their businesses, they don't want to be locked into joint ventures with partners whose ability to continually innovate is unknown. Rather, establishing relationships with firms where there is a mutual understanding that specific projects will dictate the frequency and extent of collaboration is the preferred option and it is through this project specific approach, that Larsen & Toubro has established a huge number of long term mutually-beneficial relationships with foreign firms that transcend individual instances of collaboration around a specific project.

This emphasis on being able to rely on mutually beneficial relationships when the opportunity arises would appear to be an interesting hybrid between a relationship marketing and transactional marketing orientation in that it offers the best of both worlds but the frequency and extent of subsequent project specific collaborations is entirely dependent upon having the capacity to be innovative and bring new technology to a joint project in a relationship that has been built on "faith and trust". One Larsen & Toubro executive commented "what is long term is the relationships, the understanding, continuously complementing each other's business...the signing of a collaborative agreement has no meaning...what is important is understanding and relations".

Discussions with senior management at Larsen & Toubro also revealed that they are very proactive in engaging with Indian universities in an effort to source novel

technologies emerging from the academic sector. Because he feels that the universities don't do a good job of communicating the business applications associated with the technologies being developed, this again, underscores the importance of establishing relationships such that industry at least is able to learn of these technologies and then themselves determine which technologies have legitimate business application. It would be interesting to test the utility of the knowledge management model outside of the typical business-to-business relationship in order to determine the nature of this type of exchange along with the facilitators and barriers to this type of knowledge sharing.

In addition to the afore-mentioned lack of communications, an additional identified barrier is the idea that Indian universities would appear to be unfamiliar and uncomfortable with the notion of sponsored or contract research, where an industrial partner seeks to have technology developed; not so much that they are closed to the idea, but that they operate along time frames and with resources that entail too long a period of time from the perspective of the industrial partner. Additionally, a challenge for industry partners is the changing landscape in terms of intellectual property rights. Larsen & Toubro recognize the importance of this and as such, have filed for over 100 patents over the past three years with the challenge being to determine where to file for patent protection outside of India.

A novel approach to knowledge management/sharing in the B-2-B context that Larsen & Toubro utilises stems from their establishment of a number of not-for-profit training institutes whereby staff from firms that are doing business with v are able and encouraged to send staff to the institute in order to be kept abreast of developments in the technology such that there is added value in their relationships with Larsen & Toubro. It is another example of Larsen & Toubro being proactive in managing relationships through the sharing of knowledge with partners such that they are better able to stay on top of the technology that serves as the basis of the commercial relationship with Larsen & Toubro.

Summary and Implications

As interest in better understanding how to capitalise on B2B knowledge networks increases, it will be prudent to investigate the extent to which knowledge management within a network context has been addressed by researchers outside the domain of typical IMP type research. To this end, we have introduced a network knowledge management model from the operations research literature to illustrate the extent to which, at least, dyadic knowledge flow can be investigated.

The Indian case study illustrates the significance of the characterisation of knowledge as well as various facilitators such as their sophisticated knowledge management information systems, and challenges such as distance/proximity and various inter-organisational barriers in influencing knowledge flow between actors, not the least of which is the attitude towards interorganisational relationships and whether a partnering mentality should transcend specific projects or be limited to individual cases of collaboration.

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