A Framework for Knowledge Integration and Social Capital in Collaborative Projects

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Abstract: Collaborative projects are increasingly common today and such projects require specialized knowledge of the partners to be integrated, therefore posing the challenge of inter-organizational knowledge integration; integrating diverse knowledge bases across organizations. Studies on knowledge integration and inter-organizational networks indicate the positive influence of social capital in the context. Since partners in a collaborative project are likely to possess this resource due to their partnership, a knowledge integration view is adopted to conduct an empirical investigation of a three-partner collaborative project to investigate the influence of social capital. The study shows how the different aspects of social capital influence the knowledge integration behaviour of the partners for the project. Implications to research and practice are discussed.

Keywords: social capital, collaborative projects, knowledge integration

1. Introduction

Collaborative projects for mutual benefits between partners are becoming increasingly common for several reasons including increasing competition, improving transactional efficiencies, improving resource efficiency (e.g. Simatupang et al 2002). Of interest to this study are collaborative projects that involve existing partners collaborating on a project with or without an external vendor. The implementation of such projects requires knowledge from each of the collaborating organization that can be highly differentiated and therefore has to be integrated for the project (Pan et al 2001, 2007). Collaborative project implementation therefore, can be viewed as a process of inter-organizational knowledge integration.

Knowledge Integration (KI), in this context is conceptualized as *the process through which disparate, specialized knowledge across organizations is combined, applied and assimilated* (Bhandar et al 2007*).* For instance, in collaborative IS/IT projects, each organization has to contribute knowledge related to their workflows /processes/system. This knowledge is then combined and applied to build the system. Lastly they assimilate the system by making necessary changes to their work practices (Faraj and Sproull 2000) by adopting/using the system. KI is essential in these projects since if knowledge from a particular organization is missing or is not integrated, the project outcome may suffer.

Managing the implementation of a collaborative project is therefore an essential yet challenging task. The challenge is not only because knowledge is often dispersed, differentiated and embedded (e.g. Pan et al 2007) in the various collaborating organizations but also because each organization has its own agenda and may possess diverse competencies (Pisano 1994) and conflicting interests. *How then can such projects be managed effectively?*

The importance of social capital has been noted for KI (e.g. Pan et al 2001) as well as in the context of inter-organizational networks (Liebeskind et al 1996; Kale et al 2000). Social Capital is a resource based on social relationships that inheres in structures such as organizations and organizational networks (Nahapiet and Ghoshal 1998) and can manifest as trust, norms, cooperation, information benefits and power (Adler and Kwon 2002) and that influences the behavior of the members. *But what aspects of social capital are significant and how exactly do they influence collaborative projects?*

To address this question an empirical study of a collaborative project that involved three partners and an IT vendor was conducted. The project was viewed as an inter-organizational KI process and was analyzed using a social capital framework. If the primary goal of collaborative projects is to integrate knowledge then a KI view is justified and studying the environment that influences the behavior of the organization towards the process can answer the questions raised earlier. This study extends the indication by most studies on the significance of social capital on KI in inter-organizational settings by elucidating the specific aspects and exact nature of its influence in collaborative projects.

2. Literature review

2.1 The KI view of collaborative projects

This study bases itself on the view that knowledge exists both in the individual and the collective (Nonaka 1994). Individual knowledge is personalized information related to facts, procedures, concepts, interpretations, ideas, observations and judgments, possessed in the mind of individuals that exists as justified belief and increases the capacity for effective action (Nonaka 1994). Organizational knowledge (the collective in this study) is embedded in and carried through multiple entities that include organizational culture and identity, routines and policies, systems and documents as well as individual employees (Grant 1996).

Table 1: Summary of KI definitions and views

Definition	Author/s
Application of knowledge	Grant 1996
Synthesis of knowledge bases	Alavi and Tiwana 2002
Process view- an ongoing collective processes of constructing, articulating, and redefining shared beliefs through social interaction of organizational members	Huang et al 2001
Distinguish between knowledge integration process and knowledge integration per se. The process involves the actions of group members by which they share their individual knowledge within the group and combine it to create new knowledge. By contrast, knowledge integration is the outcome of this process, consisting of both the shared knowledge of individuals and the combined knowledge that emerges from their interactions	Okhyusen and Eisenhardt (2002)
Tiwana defines knowledge integration specifically in the context of IS projects as the process of embodying business application domain knowledge with technical knowledge in the design of the software.	Tiwana (2004)
Process view- process through which relevant knowledge is combined, applied and assimilated	Bhandar et al(2007)

Scholars have proposed different definitions of KI (table 1). For this study, KI as proposed by Bhandar et al (2007) is adopted since it incorporates a process view and can be easily applied to an inter-organizational context. According to them, KI is the process through which relevant knowledge is combined, applied and assimilated for the project. Extending this definition to the context of a collaborative project, it is the process that involves the combination, application and assimilation of knowledge across collaborating organizations. The process incorporates several activities starting from project negotiations to the post-implementation stages and is also influenced by the behavior of the collaborating organizations towards the project.

From a KI view, coordinating collaborative projects is not easy given it involves the integration of knowledge spanning cross functional capabilities (Carlile and Rebentisch 2003) which is more complicated compared to integrating one kind of knowledge across individuals or groups(Grant 1996), notwithstanding the inherent characteristics of knowledge that can make its integration difficult. The common knowledge (Demsetz 1991) that exists in inter-organizational set-ups is also modest (Grant 1996) further making KI difficult. Apart from the 'knowledge' related challenges, collaborative projects also involve the challenge of managing multiple organizations with distinct competencies (Pisano 1994) and conflicting interests. Differing and distinct businesses interests and strategic objectives increase time needed for consensus on collective goals and action needed for the project. These conflicts although healthy from the perspective of the organization can affect their behavior towards the project in terms of knowledge contribution, assimilation etc.

So how then are these challenges addressed in collaborative projects? Scholars have suggested the role of social capital, a resource based on relationships to positively influence KI and formation of networks (Pan et al 2001; Walker et al 2007). The following section therefore reviews social capital literature and describes the framework that will be used for the study.

2.2 Social capital –THE OMA schema

Social capital, defined as the resource that exists in network of relationships possessed by an individual or social unit (Nahapiet and Ghoshal 1998) has been emphasized for KI (e.g.Huang et al 2001) as well as for inter-organizational networks (e.g. Liebeskind et al 1996). It improves coordination and cohesion within the structure, helps in aligning the different stakeholders to the collectives' goal and reduces time and effort associated with developing an agreement (Huang et al 2001; Lesser and Prusak 2000). Individuals use the network as a rationale for deferring immediate individual interests in favor of long-term group and organizational goals (Leana and Van Buren 1999).

Adler and Kwon (2002) propagated social capital as an umbrella concept and identified opportunity, motivation and ability(OMA schema) as its three sources that need to be present for social capital to exist. The OMA view of social capital is used for this study. The rationale being; (1) it is comprehensive and integrates the many facets of social capital (2) allows its application and analysis at the organizational level (3) incorporates practical aspects like motivation and resources that significantly affect social behavior of the organizations. The paper argues that social capital influences the KI behavior of organizations towards the collaborative project. The three sources of social capital (OMA) as proposed by Adler and Kwon (2002) are discussed ahead.

The Opportunity Source of Social Capital (O) reflects the accessibility that the network provides for social capital transactions. For example, in a collaborative project the prior relationship/ties between the partners provide an opportunity for members to interact and share their knowledge for the benefit of the project, thus performing an action based on the social capital. *The motivation source of social capital (M)* is the motivation that contributors have to help recipients even in the absence of immediate or certain returns. It is usually facilitated by norms and a sense of trust (Putnam's 1993). Norms represent the degree of consensus in the network (Coleman 1990) that facilitate cooperation and motivate actors to engage in exchange processes (Putnam 1993). Apart from the softer aspects like trust and norms, motivation is strongly influenced by practical aspects like anticipation of benefits, perceived effort and costs. *Ability (A)* construes the competencies and resources of the network members to be able to contribute to the social capital. Shared languages, codes, and narratives build a shared understanding and collective knowledge in the network, thus improving their ability to contribute and comprehend the knowledge in the shared pool. For e.g., bio tech firm networks share a high level of common knowledge and shared understanding because of their similar domain knowledge and shared codes. Thus the ability of members to comprehend and contribute requisite knowledge is higher.

Based on the above discussion, *Social capital for this study is defined as the resource that exists/evolves due to the presence of OMA in a structure (e.g. inter-organizational project) and that facilitates action towards the goal of the structure.* This study focuses on the aspects that lead to the development of social capital and not on what constitutes social capital.

3. Research methodology

Qualitative research method was adopted for this study since it allows an emphasis on processes and meanings (Denzin and Lincoln 1994) essential for this study investigating a KI process. The case study method was deemed appropriate for data collection since the phenomenon of KI is closely intertwined with the context of the collaborative project (Yin 2003). The study also required informants to reveal sensitive data (e.g. partner relationship) that required comprehension of the context (e.g. to interpret the quotes in light of their relationships) which was possible through long and informal interviews. This project was chosen for the study based on three criteria: the project was recently completed to ensure that participants could recall events, permission to study the project was granted by the top management so as to allow access to rich data, and it provided a right context for the study, a collaborative project with a seven year partnership.

The main source of data was face-to-face interviews conducted with representatives of each organization involved in the project at different hierarchies (top management, middle management, team members and users). Questions were asked to understand the motivations/expectations/views of each organization for the project, their account of how the project progressed, the conflicts, resolution of conflicts etc. The richness of the data came from the fact that at-least one organization would have a different perspective of an issue, which brought out the inter-organizational and knowledge dynamics we were looking for. The issues were then explored through more questions and

for evidence from secondary sources. Secondary data was collected from organizational websites (e.g. organizational background), articles, and third parties (employees of the companies not involved in the project). The multiple sources provided for triangulation (Stake 1994) of evidence and ensured that facts stated by one could be verified by others and also provided multiple perspectives.

Data analysis was done in iteration with data collection (Myers 1997). Data collected was transcribed in consideration with recording media for qualitative studies (Walsham 1995, 2006). Themes were identified using open-coding (Strauss and Corbin 1990) that influenced the organizations KI behavior throughout the project. For instance, 'prior experience' and 'lack of motivation' were identified as themes that influenced 'requirement gathering' since they affected time taken/outcome for that activity. Interesting comments, surprising revelations, special notes/observations made during the site visits or interviews were also considered. For example, highly formal atmosphere, and interviewees being very guarded in disclosing facts were all noted. The identified themes were theoretically abstracted to arrive at a framework figure 1.

Table 2: Case data collection details

Organization	Interviewees	Interviews	Interview background
IT Vendor	General manager	3	Was the lead to the case. Interviews were semi-formal and detailed data included e-mail exchanges and phone calls. Provided third party perspective on the partners relationships, project procedures, management, IT capability etc.
	Account manager	2	
	Business development manager	3	
	IT manager	1	
PhotoChem	Logistics manager (Project manager)	1	Logistics manager provided data on reasons for initiating the project, for selecting the IT vendor, on the inter-departmental communications and inter-organizational communication. Other department managers provided data on system adoption, their involvement in the project and on the issues on system adoption by the partners.
	Shipping manager	1	
	Shipping supervisor (user)	1	
	Warehouse manager (users)	1	
	Warehouse supervisor (users)	1	
Service providers	Directors	2	The directors talked about their lack of motivation for the project and how/why they agreed. The operations officer spoke about the system, meetings for system development, their problems in updating the system
	Operations officer (user)	3	

4. Case description

In early 2001, PhotoChem, a Japanese MNC that produces photographic chemicals, explored the idea of a web-based collaborative logistics system through which it could interact with its logistics service providers, online. PhotoChem realized it was inefficient to interact with them through faxes and phones and selected ChemXlog; an IT firm specialized in providing collaborative logistics systems for chemical companies, as the vendor. ChemXlog would now assist PhotoChem in getting the service providers on board the system, a task that was not going to be an easy. The logistics service providers; a haulier and a freight forwarder provided services to ship PhotoChem products around the world. The background of the four firms is described in table 3. Both, the haulier and freight-forwarder were cost conscious and traditional firms with limited knowledge and use of IT. They both used a 56 kbps dial up modem to access the internet. The freight-forwarder's director confessed:

> *"Computers stuff? I'm not good at that".*

PhotoChem shared a nice seven-year relationship with its service providers. They functioned like a close-knit community and none indicated any issues against each other. PhotoChem did experience operational inefficiencies in its logistics workflows for which it felt the need for the system. Its logistics manager said:

> *"We faced problems and internal inefficiencies ranging from inter-departmental communications, manual operations documents getting lost and extra payments being made at the port for delayed pick-up and so wished to streamline the logistics processes."*

The IT vendor, ChemXlog, is a small private limited IT firm that specializes in developing and implementing collaborative logistics solutions for private logistics communities in the chemicals industry. It was formed by pooling the collective domain expertise of SembCorp industries (SCI), a logistics giant in the region and Singapore Computer systems (SCS), an IT firm. This parentage provided it with a strong logistics expertise. It was also one of the few companies that could provide direct access to TRADENET, a system that companies were mandated to use to file their trade documents. These were also the reasons PhotoChem decided on ChemXlog as the vendor. ChemXlog then met with the service-providers to get the project started and understood the relationship between the partners since it was a Singaporean firm and had worked with similar communities before. It empathized with the service-providers and their reticence to the system. Its task was also difficult because PhotoChem expected the service-providers to share the cost of the system.

4.1 The project

The directors of the service-providers were so averse to technology that they had their emails printed out for them. They were not receptive to change and from their perspective, this system only entailed additional work and costs for them. The tension between the partners was due to their distinct strategic directions as revealed by the haulier's director:

> *".. the basic directions are quite different. ChemXlog is eager to solicit business, the freight-forwarder's basic attitude and direction are just like mine; we don't see immediate interest or savings. Of course there will be some argument and conflicts. In terms of the system, we have no problem. They [ChemXlog] have the required expertise."*

ChemXlog took three months to convince the service-providers and managed to get their assent after it got them a government grant that was to help SME's (small and medium enterprises) pay for technology projects. The service-providers confided that they acceded to the system partly due to their vulnerable strategic position; PhotoChem was a major client and the service-providers felt the system could lock them in a long-term relationship hence business, although there was no formal commitment on this from PhotoChem.

Table 3: Background of the collaborating organizations

Collaborative Partners	Background and Nature of Business	Use of IT Prior to the Project
IT vendor- (ChemXlog Pte Ltd.)	Small IT firm that develops and implements collaborative logistics solutions for private communities. The parent company is a major logistics company.	High
PhotoChem	One of the manufacturing facilities of a Japanese MNC. Employs 150 people and is a major client for the two logistics service providers	High. Use legacy systems and had experience with a JDEdwards system
Freight-Forwarder	A small firm, incorporated in 1995 with annual turnover of S$1.5m. Coordinate with haulier for servicing clients logistics activities	Minimal. Accounting package and e-mailing
Haulier	A small firm, founded in 1987, and annual turnover of $6m. Owns a fleet of trucks and containers that are coordinated manually	Minimal. Only for word processing and e-mailing

The system was developed through prototyping; an initial prototype was built by ChemXlog that was continually refined through inputs from the partners over several collective meetings. The

development lasted for six months and involved abundant inter-organizational interaction to design GUI's (Graphical user interface) and workflows for the system. The process required the logistics partners to understand questions posed by ChemXlog and be able to chart workflows of business processes to be built into the system. Each organization wanted a GUI suiting them, thus resulting in conflicts but were overall cooperative in resolving issues. They also exhibited a consideration for others' requirements. A user from the freight-forwarder's very understandingly quoted:

> *"Some may want to see more information and some may think the lesser I see, the lesser problems."*

In terms of understanding each other's domain knowledge and interacting with ChemXlog for stating requirements, this stage was surprisingly smooth considering the diverse functional backgrounds. ChemXlog's knowledge of logistics was a tremendous help. This stage required extensive sharing of business information with each other and ChemXlog. The partners trusted ChemXlog on this issue.

After the system was implemented the initial adverse feelings of the service-providers' changed. The directors were pleased and felt locked in a long-term relationship with PhotoChem. The system was very well received at PhotoChem. A review committee was set-up to identify issues related to the system, coordinate with ChemXlog or related parties to resolve those issues and also follow up on system updates and other progressive issues. The review committee met once in two months and comprised of core users and project managers from the partners. Users could share their issues with the committee but interestingly they raised only a few technical issues although they faced many more because they did not wish to disrupt the community. One user from the freight-forwarder said:

> *"We did mention some issues about the system being slow etc., as for the other changes, we didn't raise them, since everybody seems fine with the arrangement now. We do not want to disrupt them".*

PhotoChem adapted well to the system. They did face difficulty getting forklift drivers to use the system and to deal with it, assigned a leader to each warehouse section that would be responsible for teaching the rest. In response to the system there was also a merger of departments. There were some issues at the service-providers' end in adopting the system. There were delays in updating the system and PhotoChem's warehouse manager said he had to telephone to remind them to update the system, yet empathized with their slackness. The service-providers complained of difficulty logging in to update since they used dial-up connection and the slow speed caused delays. They also said they felt more comfortable using phones and faxes to get immediate confirmation in instances such as truck break down. Despite these issues, they agreed the system was easy to use and that eventually they would get used to it.

5. OMA analysis

This project involved four organizations: PhotoChem, its two logistics service-providers and the IT vendor (ChemXlog). Conceptualizing social capital as the resource present in the project due to the presence of OMA in the collaborating organizations, in this section the influence of OMA on the KI behavior of the organizations is elicited. Analysis was conducted as follows: interaction between the organizations and the absence/ presence of OMA was noted for key activities (e.g. lack of motivation in service providers for buy-in). Aspects that enabled/facilitated/impeded OMA for that organization were then identified (e.g. prior ties and project structure enabled opportunity source of social capital). Lastly the influence of the presence/absence of OMA on the KI behavior for the project was elicited. The OMA analysis, summarized in table 4, is discussed ahead.

5.1 Opportunity

Adler and Kwon (2002) proposed that opportunity source of social capital is provided by network ties and configuration. Consistently, in this study prior ties and project structure provide the opportunity for social capital transactions.

The seven year partnership provided the opportunity for the firms to engage in social capital transactions and that influenced the project. The prior ties provided a sense of obligation between them, evident in the following instances: during the collective meetings, the service providers would 'nod' their head and say 'yes' to every proposal easily because they did not want to appear uncooperative to PhotoChem. This can be seen as norms of behavior that govern relationships and appropriate behavior of members in a network through institutionalized rules (Gulati et al 2000).

Table 4: OMA analysis

Social capital	Aspects	Effect on the knowledge integration behavior of the collaborating organizations
O	Prior ties, seven years of partnership	Cooperation, compromises, tolerance, Understanding, obligation -obligation in saying 'yes' in collective meetings, being cooperative for meetings, making compromises on GUIs, being tolerant towards service providers when they were not updating the system.
	Project structure	Not very effective in this case since it was very informal and the interaction it could provide was already present. It was an opportunity for the vendor to build relationships and ties with the partners
M	Obligation/ trust	Service providers felt obliged to return PhotoChem's favor, i.e business of seven years and so agreed to their proposition. The trust that PhotoChem would return their favor by long term business also helped get their buy-in. Service providers had not signed any agreement/contract even with vendor since they trusted vendor would not leak any information
	Need, benefits	PhotoChem's need for the system meant their commitment and effort to the project. Service Provider's lack of perception of benefits delayed their buy-in for the project, their effort in acquiring resources for the project and adopting the system. The vendor's motivation for business made them exercise effort to get the government grant for the service providers, build relationships with the partners and coordinate the project.
	Contractual	Comments from service providers suggest that a commitment for extended business from PhotoChem may have expedited buy-in.
A	Shared codes/common knowledge provided by prior experience	The partners understood each others requirements and jargon and hence it was easy while gathering requirements and during the collective meetings making knowledge integration harmonious. The vendor's common knowledge with the partners in logistics and knowledge of software made it easy for them to comprehend the requirements again making knowledge exchange easy.
	Specialized knowledge	The vendor's domain knowledge in software and logistics was one reason for their selection. This ensured harmonious knowledge integration since there was dependency, every cluster knew the importance of /complementarities of the other organizations' knowledge.

The ties also induced cooperation for scheduling collective meetings which eased ChemXlog's difficulty in arranging meetings convenient for all four organizations. Their ties also helped in achieving consensus on GUIs when there were conflicts when each organization demanded a GUI intuitive to them. ChemXlog would call for a collective meeting to resolve the conflicts during which the service-providers empathized with PhotoChem's need to see all the fields and so compromised, even though it meant a complex GUI for them. PhotoChem reciprocated by being tolerant of the service-providers' slackness in adopting the system. One user from PhotoChem said:

> *"The service providers don't just do our business and not all of their customers use this system... So updating the system is out of their normal business procedures. We understand if they take longer to update and remind them to do it."*

Even when the review committee was set-up, users did not mention all issues since they did not want to disrupt the community thus exhibiting concern for the collective and willingness to compromise for collective good.

In terms of the project structure; in this case there was no formal project structure and interaction between organizations was informal since they knew each other thus making access to knowledge faster. In addition the regular meetings and frequent interaction provided a favourable conduit for knowledge flows. For instance, users from PhotoChem would call up the service providers to remind them to update system. The opportunity source of social capital therefore in this project in the form of ties of seven years between the partners and an informal project structure induced cooperation, compromises and tolerance among the partners for easier KI.

5.2 Motivation

Motivation as a source of social capital is the incentive that members have to engage in social capital transactions and has shown to be enabled by softer aspects like trust, norms and obligations especially in the context of individuals. In a collaborative organizational setting, as previously discussed, practical aspects such as perception of benefits, effort and cost incurred also influence organizational behavior towards KI. In this case, obligation, trust, need/perceived need and

contractual terms are shown to be significant aspects for motivation. In terms of obligation; the vendor claimed that one of the reasons the service-providers agreed for the project was out of obligation to PhotoChem for their seven years of business. It was also partly due to the trust that PhotoChem would extend business with them if they agreed to the system. This can be said because there was no formal commitment from PhotoChem indicating such an arrangement. The service-providers' remark also suggests that such a formal commitment may have actually expedited their buy-in to the project inline with Parkhe's (1993) assertion that long term commitments can promote cooperation between partners since it develops mutual trust, even with uncertainty in the relationship.

The stronger motivating influence was the perceived need/need of the system. PhotoChem initiated the system to reduce inefficiencies in its logistics processes which afforded its commitment and cooperation. It was quick to adopt the system and could even get its manual labourers to use the system. On the other hand the lack of such a perception in the service-providers was one of the major hindrances in this project. Its management believed the system was of no immediate value to them and it added to their costs and effort which affected their buy-in to the system. KI was delayed since it took ChemXlog three long months to convince them for the project. One of the service-providers' director, confided:

> *"Our only motivation was the hope of getting long-term business from our major client and with the government grant some of the expense was taken care of too."*

They agreed to the system eventually but their reticence showed again when they had to start updating information on the system on a daily basis. They did so only when reminded by PhotoChem and claimed it was increased effort considering they still did manual updates for the other clients and had to use the system only for PhotoChem. The slow speed of the dial-up connection and their discomfort with technology added to their slack.

For ChemXlog, the key motivation was the business and potential business from other chemical firms in the hub if this project was a success. This drove them to go through the extensive process to help the service-providers get the government grant to pay for the project. To get the buy-in of the service-providers and make sure they used the system, ChemXlog also made effort to build personal relationships with the users and bought them pastries thus trying to assist in assimilation of the system.

5.3 Ability

Ability dimension of social capital represents capabilities that members have to engage in social capital transactions. The capabilities are provided by shared codes, shared jargon and common knowledge; all of which provide a common platform for members to comprehend and exchange knowledge. In this case, the ability dimension of social capital is enabled by: common knowledge or shared understanding that existed between the partners due to their prior ties, resources and infrastructure, prior experience of PhotoChem with IT projects and the specialized knowledge of the vendor which was sufficiently complementary with that of the partners yet afforded some understanding of their domain knowledge. The long-term association between the partners provided a shared understanding of issues and each others' business processes that allowed for faster consensus and resolution of issues. This was evident when the service providers said they were cognizant of PhotoChem's need for the system although they themselves perceived no need for it. Even PhotoChem was tolerant of the service providers' slack in adopting the system and expressed their understanding of their constraints. When consensus was needed on GUIs, the service providers expressed understanding for PhotoChem's need to have so many fields on the screen and compromised, although it confused them. Knowledge and awareness of each others processes therefore harmonized KI.

The aspect of resources and infrastructure in this case also provided ability for KI in terms of applying knowledge and even assimilating knowledge. PhotoChem's prior experience in implementing and adopting the JDEdwards system helped its system assimilation. Its users said they were accustomed to train their laborers to upgrade themselves and so that helped in getting the forklift drivers who had never seen computers before to use the system. The service-providers on the other hand lacked technical competence to comprehend the system's proposed benefits which delayed their intellectual buy-in (Huang et al 2001). ChemXlog's sales manager said:

> *They [service providers] did not understand the technology so refused to acknowledge the benefits of the system. Their lack of experience and discomfort with new technology meant slower adoption."*

The service providers did agree that lack of resources was one reason why they were against the system and that they eventually agreed because they got the government grant to pay for the project. The lack of decent infrastructure in terms of broadband connection and exposure to technology like computers and internet compounded their slack in assimilating the system. Their users were uncomfortable with system and would not update the system on time claiming it was inconvenient to use and that it was slow because of the 56kbps connection. They had to be reminded to update the system everyday.

Although the case shows that the lack of technical competence in addition to the lack of infrastructure (e.g. no broadband connection) affected system assimilation, ChemXlog claimed that it had a positive implication too. The sales manager from ChemXlog added:

> *"It was better that way. Otherwise we would have to spend lot of time answering many questions on security etc. like we did with PhotoChem."*

ChemXlog expressed fear that the software was quite simple and only had to be customized and implemented which if clients possessed some IT sophistication could do it themselves. This revelation suggested that complementarities between the organizations provide the dependency which makes the inter-organizational arrangement meaningful (Ciborra and Andreu 2001). The prior experience and knowledge base of the vendor provided some common knowledge to ease their communication with the partners but also made the partners dependant on its knowledge base. Another aspect of the ability dimension that was significant in this case was the specialized knowledge base of the vendor. The fact that they were a subsidiary of a logistics company and a software company provided them with specialized knowledge needed to implement the system as well as common knowledge with the partners' knowledge bases that helped them comprehend the partners' business processes. PhotoChem acknowledged that this partly a reason why they engaged ChemXlog. The service-providers also acknowledged the ease with which they could communicate requirements and business processes with the Vendor. The vendor proudly acknowledged its strong logistics backing and said it made it easier in terms of comprehending the partners' requirements and applying that knowledge to build the system.

6. Discussion

The objective of this study was to unravel the role of social capital in collaborative projects. Through an OMA analysis of a collaborative project viewed as a KI process, the study finds that social capital conditions the project environment by influencing the KI behavior of the collaborating organizations. Specifically: 1) The Opportunity source of social capital provides *access* to the organization's knowledge required for the project 2) The Motivation source of social capital provides the *raison d'etre* for organization's involvement in the project and 3) The Ability source of social capital provides the platform for knowledge exchange and accentuates the complementarities of organizations' knowledge for harmonious KI. The findings are summarized in table 5 and also organized in a framework (figure 2) depicting the interaction between KI and social capital in collaborative projects.

Table 5: Influence of social capital on collaborative projects

Finding	Description
The Opportunity source of social capital provides access to the organizations' knowledge	The Opportunity source of social capital in terms of prior ties, relationships and structures provides access to the organizations' knowledge and aids in locating knowledge needed for the project.
The Motivation source of social capital provides the raison d'etre for involvement in the knowledge integration process	The Motivation source of social capital in the form of trust, obligations, system benefits, effort and cost incurred provide the raison d'etre for effective involvement in the knowledge integration process and directs effort towards project goal.
The Ability source of social capital accentuates the complementarities of organizations' knowledge for harmonious knowledge integration	The Ability source of social capital provides the common knowledge and hence a platform for knowledge exchange while also accentuating the complementarities of the organizations knowledge for dependency and harmony in the knowledge integration process

The framework (figure 1) shows how the various sources of social capital condition the project environment by influencing the KI behavior of the organizations. The three source of social capital (O, M and A) and their aspects significant in the context, are shown in separate boxes around the project structure viewed from a KI perspective. The nature of influence of each dimension on the KI structure and behavior of the organizations is shown in block arrows leading from the social capital dimension boxes to the project structure.
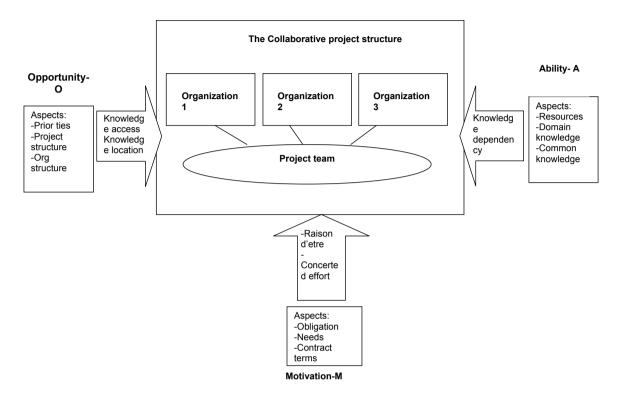

Figure 1 Framework for KI and Social Capital interaction in Collaborative projects

6.1 Opportunity provides access to organization's knowledge and facilitates knowledge location

Prior studies acknowledge that cross functional teams may not be difficult to set-up, but can face the challenge of accessing the breadth and depth of pertinent knowledge (e.g. Imai et al 1985) and integrating that knowledge (Huang and Newell 2003). The challenge of accessing knowledge has also been noted in practitioner-oriented publications (e.g. Anand et al 2002) but the aspect has been largely ignored in collaborative projects. Another issue is locating knowledge needed for the project. In IS projects, developers apply just as much effort and attention determining whom to contact in an organization as they do getting the job done (Inkpen and Tsang 2005).

This case shows that the opportunity source of social capital provided by prior ties in the form of partnership between the organizations and the interaction structure for the project influenced the location and accessibility of knowledge required for the project. Prior ties enabled faster and easier access to knowledge since members knew each other and could easily access them through phones. It also helped that the organizations were cooperative made themselves available for the collective meetings. The ties also created an obligation between the partners; which assisted in breaking boundaries for accessing knowledge. For instance, in collective meetings the service providers felt they could not refuse a proposition and felt obligated to reveal what they had to. Ties have been noted to facilitate social interactions and provide channels for knowledge exchange (Inkpen and Tsang 2005) and this case confirms they provide access to required knowledge by inducing obligation, cooperation and lowering boundaries between members.

The informal project structure in this case also enabled access to knowledge. Contrary to the expectation that an informal would make it harder to locate and access knowledge needed for the project, this case showed that because the partners were used to interacting informally, any time any

information was needed phone calls could be made. The frequent collective meetings also provided a forum for knowledge access. Some scholars have argued that structures can act as a barrier for knowledge processes (e.g. Nonaka 1994) while some (e.g. Okhyusen and Eisnehhardt 2002) contend that absence of structure can make it difficult for groups to organize themselves for the KI process. This case shows that when prior ties are present the effect of a formal project structure is not significant. In other words, a suitable project structure for a collaborative project is contingent on the nature of ties between the collaborating organizations.

6.2 Motivation provides the raison d'etre for organization's involvement in the KI process

Situations, where firms have mixed motives with private and common interests and access to one another's knowledge may have benefits for only one partner, are not uncommon in alliances (Gulati et al 1994) and such asymmetry in benefits can lead to departures from expected collaborative behaviors (Khanna et al 1998) as is seen in the case.

In the case, the trust and hope of long term business was one of the lure the service- providers had to agree to the system. From ChemXlog's perspective, it could also be perceived as an obligation to PhotoChem for their seven years of business. Further, the need for the system ensured the commitment of PhotoChem towards the project. The lack of perception of the system's benefit and the potential costs and effort, precluded the involvement and participation of the service-providers' thus causing a delay in buy-in and system assimilation. Their comments however indicate that a commitment for extended business from PhotoChem may have expedited their buy-in thus emphasizing the influence of formal mechanism/contracts for KI.

The IT vendor on the other hand was strongly motivated for the project since it meant business for them and to get that they made extra effort, coordinated the entire project, got the government grant for the service-providers and also built relationships with the partners and users to encourage their involvement. The case therefore shows that the motivation source of social capital, provided by trust, obligation and practical motivators like benefits from the system, cost and effort incurred and the contractual terms can provide a raison d'etre for organizations to work towards the project goal. It also affords concerted effort of all organizations' towards the project goal through contracts etc.

Studies have argued for and against formal mechanisms to govern collaborative arrangements. Tiwana (2004) argues that because the acquisition of new information from partner firms is often based on tacit knowledge, simple contracts governing their transfer are typically inadequate. Others such as Inkpen and Li (1999) contend that in new or young alliances where partner firms have had little shared collaborative experience, a more formal governance mechanism serves to mitigate initial concerns of distrust and potential misconduct on the part of an unknown partner. On the contrary, this study shows that formal governance mechanisms can influence KI behavior of the organizations even in pre-existing partnerships and formal contracts can to an extent influence KI behavior regardless of the nature of knowledge.

6.3 Ability provides knowledge dependency between organizations for harmonious KI

Four aspects are considered that provide for the ability source of social capital; Prior experience, shared codes /jargon and resources and infrastructure. Although each aspect is considered individually they are closely related. These aspects provided for the common knowledge between the organizations and also accentuated their specialized knowledge.

PhotoChem's prior experience in implementing and adopting the JDEdwards system helped them assimilate the system much faster. The lack of such experience of the service-providers affected their assimilation of the system and initially even their buy-in to the project. The prior experience of ChemXlog in interacting with small firms such as the service-providers made them aware that to get the service-providers' buy-in it would be important to get the government grant that would help them pay for the project. This move helped in getting the buy-in of the service providers.

The prior ties and partnership between the partners helped in providing a shared understanding for issues and in developing common knowledge between them. This helped in achieving compromises and expediting resolution on GUI design since they were cognizant of the other organizations'

requirements and constraints thus making KI more harmonious. In terms of resources and infrastructure; the lack of required resources in the service-providers affected KI in terms of getting their buy-in and well assimilation of the system. The IT vendor's specialized knowledge in logistics and software made their knowledge complementary to that of the partners but also provided common knowledge for them to communicate efficiently. ChemXlog suggested that their own combined knowledge and the lack of knowledge of IT in the service-providers was in way good since it enhanced the complementarities of their knowledge and made the partners dependant on them. They felt like this since if the service-providers had more knowledge of IT they could have implemented the software themselves and may have extended the sales cycle by asking too many questions.

This interesting observation on the relation between common and specialized knowledge is significant. Common knowledge helps, but too much can be impeding as suggested in the case. It is important for organizations to perceive the necessity of others' knowledge, since when that is present there is a dependency and harmony. The ability sources of social capital therefore affords shared understanding between the organizations and enhances the complementary specialized knowledge base of each organization thus influencing harmony in the process for knowledge exchange, increasing ability to apply and assimilate knowledge.

Complementarities of existing firm assets have been assessed as having potential impacts on knowledge transfer in alliances (Tiwana 2004). Chung et al (2000) have also talked about the importance of Complementarities along with status similarity and Social Capital for alliance formation. This study demonstrates the importance of knowledge complementarities between organizations for effective KI in a collaborative project as well. The search for complementary knowledge bases is from ICV (International cooperative ventures) literature, which identifies the possession of complementary knowledge as conducive to ICV formation (e.g. Beamish 1988). Balakrishnan and Koza (1993) in fact define a joint venture as a special mechanism for pooling complementary assets and assert that achieving complementarities is often the *raison-d'etre* of ICVs. This case demonstrates the same phenomenon in collaborative projects. All of these suggest that if complementarities is essential for a collaborative project then ability source of social capital accentuates that complementarities and induces harmonious KI.

7. Implications and conclusion

The significance and complexity of collaborative projects motivated this study of understanding how a naturally occurring resource, social capital, can be leveraged. Using concepts of KI and social capital this qualitative case study, shows how different aspects of social capital influences the KI behaviour of collaborating organizations. The study finds that social capital facilitates access to organization's knowledge, provides a raison d'etre for its effective participation and accentuates the complementary specialized knowledge. Findings are organized into a framework (Figure 1) that represents the interaction between social capital and KI in collaborative projects.

This study makes key contributions to project management, inter-organizational and social capital literature. The framework is a critical step towards using a KI and social capital view to understand complex phenomena such as collaborative projects. The study extends the indication by prior works on the importance of social capital for KI and collaborative projects by eliciting its roles and aspects. Another significant implication of this study is the conceptualization of social capital to the context of collaborative projects. In doing so it has addressed the call of scholars that claim social capital is highly contextual and that it has to be studied in depth in each context (Koka and Prescott 2002). In addition this view incorporates the practical and organizational aspects into social capital.

The framework developed in this study comprehensively highlights the role and aspects of social capital in collaborative projects and emphasizes the KI view for such settings. It thus helps explicate strategies for managing collaborative projects. Findings indicate the importance of structures to foster ties between organizations through project team collocation, regular meetings, social activities etc. Project goal needs to be clear and mechanisms instituted to achieve concerted effort of all organizations towards that goal. Knowledge dependence between organizations should be emphasized by identifying vendors based on balancing common vs. specialized knowledge. The nature of relationships in terms of OMA can be assessed to devise appropriate and effective strategies. For instance, structures can be designed differently depending on the ties between the organizations. In situations where ties are limited they can be fostered through social activities and collocation.

 This study was conducted in an Asian country and there was an element of conservatism shown by the interviewees in revealing data that may have affected some of the insights. To overcome this limitation, multiple people were interviewed on the same subject. The organizations also hesitated to share too many project related documents and to make up for this multiple people were interviewed to get oral confirmation of the data. It must also be noted that this study has the inherent limitations of a case study in terms of it being very context specific. The goal of this paper is therefore not to make generalizations applicable to all settings, but to be able to contribute to the underlying KI theory. The findings in this paper are based on a single case study and need to be further researched through questionnaires or more detailed case studies. This study provides two new significant perspectives through which collaborative projects can be studied using the framework as a starting point.

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