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December 2002

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SOCIAL CAPITAL IN ERP PROJECTS: THE DIFFERENTIAL SOURCE AND EFFECTS OF BRIDGING AND BONDING

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Abstract

In this paper, we explore innovation processes surrounding the design and implementation of ERP systems in two case companies, looking at this from a knowledge integration perspective. More specifically, we examine the relationship and network building processes that are necessary to support knowledge integration and user involvement during innovation. In doing this, we utilize the concept of social capital and relate the different sources and effects of social capital to the different innovation episodes. This highlights how the bridging and bonding aspects of social capital are differentially important during different episodes and leads us to conclude, contrary to the suggestion of Adler and Kwon (2002), that it is helpful to differentiate between the two.

Keywords: Innovation, project management, system implementation, ERP systems, social capital, case study research

1 INTRODUCTION

The concept of social capital has become very popular in Management Science, based on the recognition that social networks are useful in a variety of contexts (Coleman 1988) and can influence a wide range of outcomes (Burt 1997). Here we are interested in the ways in which social capital influences innovation processes (Hansen 1999). Specifically, we explore the ways in which social capital influences the sharing and integration of dispersed organizational knowledge during IS/IT innovation, focusing on enterprise resource planning (ERP) projects. ERP systems have been developed in response to the need to manage across global businesses—a difficult task when each business is using different systems and technologies (Imra et al. 2000). A growing number of companies are investing in ERP systems (Davenport 1998), but evidence suggests that implementing such systems is often problematic (Shanks and Seddon 2000). Thus, research exploring ERP (or similar) innovation processes would appear to be timely.

We focus on the source and effects of social capital during the adoption of ERP systems. The source of social capital lies in the social structure within which actors are located (Adler and Kwon 2002). Network structures will vary in their quality and

configuration, for example, in terms of the extent to which actors' contacts are also connected (Coleman 1988) and in the content of the network ties (Uzzi 1999), for example, the extent to which the connected actors share common knowledge and/or beliefs. This will influence the development of social relationships (Granovetter 1973). As individuals interact with each other, social relationships are built, and goodwill develops (Dore 1983) that can be drawn upon to gain benefits. While the terms of exchange are not clearly specified, there is a tacit understanding that a *favor* will be repaid at some time and in some way. This repayment (the effect of social capital) may be in the form of information, influence, and/or solidarity (Sandefur and Laumann 1998). In this paper, we explore the influence of social capital through two interpretive case studies that highlight how different sources of social capital become more or less important during different episodes of the innovation process. Before we move to the cases themselves and our research methodology, we next consider the literature on innovation processes and social capital.

2 INNOVATION PROCESSES

Once a company has decided to adopt an ERP system and has made its selection, it will typically set up one or more project teams to design and implement the system. This team must map existing organizational processes, identify the processes that are embedded in the ERP software, and define new organizational processes that fit both the software and the organization (Soh et al. 2000). This design process necessitates the integration of knowledge. Individually dispersed and organizationally embedded knowledge must be combined with the knowledge embedded in the ERP software (Lee and Lee 2000). User involvement and commitment must also be gained (Markus and Keil 1994).

We can look at these various activities as episodes of the innovation process. Robertson et al. (1996) outline a four-episode innovation model, which builds on the original stage model of Rogers (1983), viz:

- *agenda formation*, when the original idea, here to adopt ERP, is accepted and preparations made (e.g. formation of project teams) to facilitate adoption
- *design*, which involves understanding the ERP and organizational processes and fashioning a mutual fit
- *implementation*, which involves configuring the IT system and changing organizational systems and processes
- *appropriation*, when the ERP system is fully embedded within the organization so that it is accepted as routine

These episodes should be seen as iterative, rather than linear (Robertson et al. 1996). Thus, we view ERP innovation as a socio-technical challenge where group and organizational dynamics and technological advancement continuously and mutually shape and reshape each other (Coakes et al. 2000).

3 THE IMPORTANCE OF SOCIAL CAPITAL

The successful completion of these project activities will depend on selecting project team members with an appropriate mix of knowledge, skills, and expertise (Teram 1999). This human capital of the team comprises both intellectual and social capital. Intellectual capital of the team refers to the "knowledge and knowing capability of the collectivity" (Nahapiet and Ghoshal 1998), and, while important, it is unlikely that team members will have all the relevant knowledge and expertise necessary. Rather they will need to network with others to make sense of both organizational processes and the ERP system and in order to gain user commitment. In doing this, they will be drawing upon their collective *social capital*. Social capital would, therefore, appear to have fundamental importance for project team effectiveness.

Despite the widespread use of the concept of social capital, the term is used differently by different authors (Hirsch and Levin 1999). Adler and Kwon (2002) highlight one central distinction in the way the concept is defined, contrasting the *bridging* from the *bonding* view of social capital. The bridging view sees social capital as a resource inhering in a social network that can be appropriated by a focal actor based on relations with others in the network (Burt 1997). Individuals who provide a bridge across divided communities (structural holes) are important, since they play a brokerage role. The bonding view, by contrast, focuses on the collective relations between a defined group (Coleman 1988). Social capital relates to the internal structure and relations within this collective. It ensures an internal cohesiveness that allows the collective to pursue shared goals.

Adler and Kwon note that some definitions do not distinguish whether the focus is internal (bonding) or external (bridging). They argue that this is preferable because, in practice, both bridging and bonding will influence behavior in all situations. They argue against “bifurcating our social capital research into a strand focused on external, bridging social capital and a strand focused on internal, bonding, social capital” (p. 35). They develop a definition of social capital which does indeed include both internal and external ties: social capital is “the goodwill available to individuals or groups. Its source lies in the structure and content of the actor’s social relations. Its effects flow from the information, influence and solidarity it makes available to the actor” (p. 23).

We agree that in practice both forms of social capital are involved simultaneously in any social activity system and, therefore, adopt their definition. However, we have found that, in relation to IS/IT projects, it is helpful to maintain the distinction because, while any given project team will engage in both bridging and bonding activities, each becomes more or less focal at different times during the innovation process. This paper, then, explores the sources and effects of social capital within two ERP project teams—one that led to the successful appropriation of the ERP system and one where the project was shelved.

4 METHODOLOGY

The research described in this paper adopts an interpretivist approach exploring and conceptualizing meanings emerging from the interaction of social actors (Walsham 1983). Here we attempt to unravel the influence of social capital on the collective actions surrounding ERP implementation. A comparative interpretivist study was conducted between 1997 and 2000 in the companies QEL and IEL (see below). The theoretical insights developed by Nahapiet and Ghoshal (1998) and by Adler and Kwon (2002) were incorporated in the research design. Klein and Myers (1999, p. 75) endorse the approach of building on existing theories rather than using a grounded theory approach (Glaser and Strauss 1967), noting that a theory can be used in interpretive research as a “sensitizing device” to view the world in a certain way.

Evidence was collected from semi-structured interviews (see Table 1), interviews via telephone and email, informal dialogues, on-site observation, and company documentation.

Adopting multiple data collection methods aided triangulation—multiple interpretations (Klein and Myers 1999)—as a means of enhancing the validity of the findings (Denzin 1988). Data collected from the various sources were analyzed based on the coding techniques proposed by Miles and Huberman (1994). The first stage of data analysis focused on building conceptually ordered displays to generate themes from each case. In particular, the four episodes of the innovation process (Robertson et al. 1996) were used to divide the themes into various clusters. The second stage compared the two cases by contrasting the two conceptually clustered matrices. By using the episodic model of innovation, we then outlined conceptual similarities and differences between the themes across the cases.

Table 1. Interviews Conducted at Two Case Companies (QEL/IEL)

Role of the Interviewee	First Interviews QEL/IEL	Follow-up Interviews QEL/IEL	Total
Project Sponsor (Senior Manager)	0*/2	0/1	0/3
Process Owners/Steering Group (Heads of Divisions)	6/3	1/1	7/4
Project Team Members	6/11	6/6	12/17
End User	0/6	0/3	0/9
Consultant (Vendor)	2/3	0/1	2/4
Total	14/25	7 /12	21/37

*The senior HR director at QEL refused to be interviewed for this study, giving as a reason that he did not know very much about the project!

5 CASE DESCRIPTIONS

QEL is a blue-chip engineering company, headquartered in the Midlands, U.K., but with business units spread across the globe. It has 40,000 employees located in more than 30 countries. A decision was made in 1998 to implement an organization-wide ERP system to replace approximately 1,600 extant legacy systems. The system selected was SAP/R3. Here we focus on the human resources (HR) pillar of the ERP system. The project was never completed, however, because the project team could not convince senior management that the expense was justified.

IEL is a major multinational player in the engineering industry, designing and manufacturing standard and custom-built products and providing consulting services for corporate clients. It has 60,000 employees in more than 70 countries. The ERP project spanned all the major business areas, in North America and in Europe. The system adopted was again SAP/R3. Here we focus only on the engineering pillar of the ERP system. The ERP system was implemented and was generally very well-received.

6 CASE ANALYSIS

The cases demonstrate that the two projects differed significantly in terms of what happened during the different episodes of the innovation process. In the analysis that follows, we consider each episode in turn and describe and analyze what happened in each case in terms of the source (the emphasis, structure and content) and effects of social capital. These are subsequently discussed in terms of different types of social capital. Table 2 provides a summary of the analysis.

6.1 Agenda Formation

QEL: One of the QEL divisions had already decided to adopt SAP/R3 in its engineering function. It was decided that the whole company should then adopt this as standard to ensure integration. There was no systematic evaluation of different systems at this stage, at least not in respect of the HR pillar. The directive was simply that this was the system to be adopted.

Table 2. Differential Impact of Bonding and Bridging on Knowledge Integration

Innovation Process	Agenda Formation	Design	Implementation	Appropriation
Source of Social Capital				
Emphasis	Bonding of project team	Bridging with users	Bonding of user groups	Bridging across communities
Structure	Closed/dense, high knowledge redundancy	Open/loose, little knowledge redundancy	Closed/dense, high knowledge redundancy	Open/loose, little knowledge redundancy
Content (norms)	Consummatory/relational embeddedness high	Instrumental/relational embeddedness low	Consummatory/relational embeddedness high	Instrumental/relational embeddedness low
Effects of Social Capital				
Effects	Knowledge sharing within team	Team gains access to broader knowledge and begins to gain user commitment	Ownership more widely dispersed across organization and creative adaptation among users	Innovation embeddedness within organizational processes and routines but continuous learning encouraged
Type of social capital	Team building	Network building	Community building	Knowledge building

The appointed project manager used his existing network of relationships to bring together the project team: five individuals from QEL and two external IT consultants. This group had never worked together before and, although the QEL members had relevant HR knowledge, none had any ERP knowledge. A designated work area was provided for the team. As each member joined the project, they received a very short induction from the project manager. Little effort was given to team building.

Overseeing the project were process owners, senior managers in the HR function, all working at the head office. Each process owner was given responsibility for overseeing a particular functional area of the HR ERP system, based on existing responsibilities. However, during this early period they had no direct involvement in the project. A series of workshops was held to inform others in HR about the project. Attendance was mandatory, but feedback from staff was that they had not learned much from these workshops. Observation of these events suggested that most participants saw the ERP project as irrelevant to their day-to-day activities.

IEL: During 1995, IEL initiated a four-month evaluation study to look at the possibility of introducing an ERP system. Employees were kept well-informed during this evaluation period and ERP seminars and conferences were organized and well-attended. Employees from the IS and engineering functions became very engaged in the project. Informal communities emerged, enabled by IEL's intranet, even before the implementation decision was made.

A central ERP team was formed comprising 14 divisional representatives and three external consultants. A steering group was established, comprising senior managers in the product divisions. Most of the core team, including two of the external consultants, had worked together previously and virtually all had been involved in the informal ERP community activity. Once the team was actually in place, much emphasis was placed on team building.

In relation to agenda formation, then, there were significant differences between the two cases in terms of their bonding and bridging activities. The IEL team focused on establishing strong bonds during this period, while bonds within the QEL team remained very loose. Developing strong bonds during this early episode appears to be critical, to facilitate knowledge sharing and creation during later episodes. Encouraging the development of strong ties (Granovetter 1973) within the IEL team increased the closeness and reciprocity between project members who developed strong common norms or "consummatory" norms (Portes 1998). Moreover, building a project team where members participated because they were interested in and knowledgeable about the project helped to ensure some knowledge redundancy within the team (Nonaka 1994). This focus in the early stages on increasing the relational and cognitive embeddedness (Granovetter 1973) within the project team lead to higher levels of cooperation (Gulati 1998) during later episodes (see below). Many of the problems experienced at QEL appeared to arise from a lack of team bonding during this early episode. Team building to enhance the bonding aspect of social capital within the project team appeared, therefore, to be crucial during this agenda formation episode. The effect of these strong bonds was that it allowed the team to share knowledge among themselves.

While the main emphasis during this episode is thus on bonding activity, creating a broader awareness of the project among the wider community affected by the innovation did begin, but only in anticipation of the tasks that the team needed to perform during the next design episode (see below). This initial bridging was successfully achieved in IEL, but not QEL. This broader awareness was important because it meant that, when the wider community needed to be more actively involved during the design and implementation episodes, the bridges (Coleman 1988) between the project team and the wider community were already partially present.

6.2 Design

QEL: The project manager divided the project into a series of independent work packages, each focused on describing the "as is" and "to be" processes for a different HR functional area. Each work package was assigned to only one project member so there was no interdependence across the team. Work packages were assigned based on members' existing knowledge and experience. Thus, even though team members were colocated, there was little interaction between them during this period.

Each project member was instructed to bring together a group of about 10 people who had knowledge of existing processes in the particular area for which they were responsible. Despite the fact that the ERP system was to be introduced globally, these 3-day workshops involved only individuals from headquarters and did not involve the IT consultants. While there was discussion during the workshops about current and "to be" processes, few insights arose because those involved did not represent the diversity of processes that existed within QEL. In most cases, the process owner responsible for the particular HR area was present at the 3-day workshop. Many found the event a waste of time and felt frustrated by the process since they had learned nothing new.

IEL: Each central team member was assigned to a functional area and instructed to work with the relevant division-based team to conduct the process analysis. However, the team leader was very conscious of the need to avoid any member working in isolation and so encouraged collaboration within the central team. The IT consultants recognized the need to understand the complexity of business processes in IEL and so were heavily involved in the ongoing process analysis. During this episode, many examples were identified where different units used different processes to undertake the same activity. These differences were discussed and common processes agreed. While the central team acted as the formal collaboration mechanism, the online forums provided an organization-wide platform to share information informally, even though there was little coordination of these informal communities. According to an internal document, these forums contributed many insights for the central team to incorporate into the design.

During the design episode then, there were again clear differences between the cases. The central teams needed the involvement of the wider community to develop the process maps that were to be used to drive the ERP configuration and organizational changes. In IEL, the central project team expended considerable effort, including traveling to diverse locations, to engage and build bridges (Coleman 1988) with a wider audience. In addition, these formal networking activities were supplemented through informal networks, which encouraged wider involvement, understanding, and commitment to the ERP project. In IEL, the ties between the project team members and the wider organizational community were much looser than those ties developed within the project team itself. This was necessary since it would not have been possible to have developed the dense network, based on a strong sense of common purpose across so many people. Thus, the network was much more open and looser, with others getting involved with the project team for instrumental reasons: to ensure that they had some influence on the developing ERP system. The effect of encouraging this wider involvement was that the team had access to broader knowledge from across the organization, which meant that differences between processes across divisions and units were surfaced and discussed in order to develop “to be” processes that suited everybody. It also meant that the team was able to encourage some commitment to the system among the eventual ERP users.

The QEL team, on the other hand, relied on a very selective group for their workshops so that few in the company were aware of what was happening and even fewer were actively engaged. Moreover, process discrepancies were avoided by the limited participation. Bridging activity, then, appears to be particularly crucial during this episode with a focus on building a network across eventual users. The bonding activity, while still important, in these cases at least, simply continued as it had during the agenda formation episode, whether this had initially been based on strong (IEL) or weak (QEL) ties between members.

6.3 Implementation and Appropriation

QEL: Having conducted the process analysis the next task was to implement the design in the ERP system, according to the proposed “to be” processes. Unfortunately, the project team had limited IT expertise, so they relied on the two IT consultants to do this work. The IT experts themselves did not see any need for involvement with potential users, working on each HR function separately, gathering information from the respective work package owner.

While this was ongoing, senior management decided there was a need to justify the costs of an integrated HR system. This occurred as the costs of the overall ERP project were beginning to spiral while the company’s economic condition was worsening. Each project team member was then asked to identify the benefits of the system for their particular functional area. However, despite the fact that the benefits from an ERP system were expected to arise largely from the integration of information across traditionally separated HR areas, there was no attempt to work collaboratively on this.

During this period, project team members began to feel insecure about the future of the project and became concerned about its possible abandonment. They began to spend time networking back in their old functional home to ensure ongoing employment should the ERP project cease. The project team presented a business case to the steering committee of senior managers on three occasions. On no occasion was this group convinced by their arguments and the project was eventually put on hold and the team disbanded.

IEL: By contrast, the implementation in IEL was relatively smooth. In the four product divisions alone, more than 7,000 tables of the ERP software were painstakingly configured. In addition, training courses and workshops were organized. While the implementation continued, another corporate-wide initiative—a knowledge management (KM) program—was started in late 1997. As part of this program, a Corporate Knowledge Centre (CKC) was set up with the support of the ERP central team. Learning from the ERP central team that a more active role was needed if the benefit of online communities was to be maximized, innovation communities were set up, facilitated by at least one member from the CKC.

In late 1998, the ERP implementation was close to completion. Three ERP central team members joined the CKC and others became involved on a part-time basis in order to help integrate the efforts of the ERP implementation and KM programs. When the ERP implementation was completed in 1999, responsibility was clearly assigned. The IS department was responsible for the day-to-day maintenance of the ERP system and the CKC for managing the learning of the innovation communities and functional groups as they actually put the ERP system to use.

During the implementation and appropriation episodes, there were again differences in terms of the bridging and bonding activity in the two cases. During the implementation episode, in QEL the communication between the IT consultants configuring the system, the central team, and the rest of the organization continued to be limited, linear, and uni-directional. Given the increasingly precarious nature of the project, team members became more actively involved in rebuilding bridges with their previous functional homes. In contrast, IEL's central team worked together with the divisional teams to configure the ERP system. The links that had been established during the earlier episodes were central in facilitating this work, and during implementation the team worked hard to ensure that all those involved had a shared understanding (Krackhardt 1992) of what needed to be done. In particular, the formal encouragement of dispersed innovation communities increased bonding between individuals actually using the system. Strong ties were established within these innovation communities, and relations became strongly embedded both cognitively and relationally. IEL's experience suggests that during the implementation episode, bonding across the dispersed user community is an important task, ensuring that ownership of the system becomes widely dispersed across those who are using it. Such ownership ensured that users experimented with the system and adapted it to suit their particular needs. Community building was thus the focus of social capital activity during this innovation episode in IEL.

During appropriation, in IEL the central team was disbanded since its job was completed. However, there was recognition that there needed to be continuous support for both the day-to-day use and evolution of the ERP system to meet changing needs and opportunities. This was achieved in IEL through setting up two independent units. Members of the central ERP team were utilized in these two units to ensure that the learning established during the project was available in the post-project environment. The bonds that had been developed were, therefore, maintained but in the context of a more dispersed network of individuals. Importantly, mechanisms were put in place by the CKC to ensure that there were adequate bridges between these dispersed communities that were using and contributing to the evolution of the ERP system. In QEL, this episode was never reached.

7 DISCUSSION AND CONCLUSIONS

These two cases demonstrate that knowledge integration is a central activity within an ERP (or similar) innovation project. Clearly, much has been written about knowledge integration (e.g., Grant 1999). In this paper, we have concentrated on the source and effects of social relationships that can support (or impede) this process of knowledge integration. Specifically, we have highlighted ways in which social capital facilitates or inhibits knowledge integration, exploring how social capital is used during different episodes in the ERP innovation process. Our research suggests that, contrary to the argument presented by Adler and Kwon (2002), it is useful to distinguish between the bonding and bridging aspects of social capital because these different aspects support the different knowledge integration tasks that are central during the various innovation episodes, as highlighted in Table 2. Of course, in reality these different foci of social network building are more iterative than is suggested, just as it is clear that the innovation episodes are not, in practice, undertaken in a linear way (Robertson et al. 1996). Nevertheless, we propose that this framework provides a useful heuristic that can be helpful for managers thinking about the networking activities that are important over the life-cycle of a project.

During the agenda formation episode, we have found that it is important for project teams to develop strong ties (Granovetter 1973) and develop a sense of a shared purpose. The focus is thus on team bonding and the development of a closed network (Coleman 1988). This allows team members to develop some common or redundant knowledge (Nonaka 1994) that is crucial for effective knowledge integration (Grant 1999). This team building creates a sense of shared destiny among the project members which leads to internalized consummatory norms (Portes 1998) based on a normative commitment to the project (Putman 1993). Where this does not happen, as in the QEL case, subsequent knowledge sharing within the team is likely to be more limited.

Once the core project team has developed a shared sense of purpose, a "collective mind" (Weick and Roberts 1993), they can begin to bring in ideas and information from individuals across the wider organization who will be affected by the implementation. In doing this, they are using their social capital to gather information needed for the project (Sandefur and Laumann 1998). External parties provide the needed information because they can see an instrumental return (Portes 1998) in doing this: the ERP system is more likely to meet their needs if they have had some influence in its design. The provision of this information gives the project team an understanding of existing legacy systems and organizational processes. Moreover, this networking activity

also begins the process of building user commitment to the new system (Markus and Keil 1994). The network focus during this episode is on bridging activity, and it is helpful if the network structure is more open, so that structural holes facilitate wider information flow (Burt 1997). Where the project team tries to work in relative isolation from potential users, as in the QEL case, there are likely to be major problems.

For the ERP system to be implemented, however, there needs eventually to be interaction between the dispersed communities so that they can learn from each others' experiences. Those working in different units need to start communicating directly with each other, rather than relying on the core project team, which will eventually be disbanded. Brown and Duguid's (2002) discussion of communities of practice is relevant here. Dispersed communities can encourage learning through "legitimate peripheral participation" (Lave and Wenger 1991). This is likely to facilitate the implementation process as individuals in different parts of the business can learn from the experiences of others. During this episode, in IEL, these communities were formally planned and encouraged. In the literature there is a debate about the extent to which such communities can be planned since the original idea was very much that they were the emergent product of shared practice (Brown and Duguid 2002). Perhaps in IEL these *planned* communities were successful precisely because they had first been allowed to emerge more informally. Certainly more research is needed in this area. Finally, there is a need to create a more formal knowledge network, which anyone in the organization can use if they need more insight into the system. In many organizations this will take the form of a help desk. In IEL, this was supplemented by the CKC, which encouraged continuous innovation of the ERP system to meet changing needs.

It is important to note that this paper has focused on the importance of both the bridging and bonding aspects of social capital during innovation, noting their differential impact during different innovation episodes. While not the specific focus of this paper, what is also clear from the two cases is that social capital can have a negative, as well as a positive, impact on the innovation process: more bridges or more bonds are not necessarily always a good thing. For example, in the QEL case, project team members used their social capital ties with their former functional colleagues to ensure that they were able to secure alternative employment should the project fail. We have reported this downside of social capital elsewhere (Newell et al. 2001) as others have also done (e.g., Hansen 1999). More research is, therefore, needed to identify the advantages and disadvantages of social capital during innovation processes. However, the argument presented in this paper would suggest that research should focus on how these advantages and disadvantages change during different episodes of the innovation process.

In conclusion then, we have demonstrated in this paper that the distinction between the bridging and bonding aspects of social capital is an important practical distinction (cf. Adler and Kwon 2002). Complex, interactive innovation projects, such as an ERP project, are heavily dependent on networking activity. While both the bonding (Coleman 1988) between project team members and the bridging (Burt 1997) across dispersed communities is continuously important over the whole of the innovation process, these sources of social capital become relatively more or less important during different episodes. This is because the effects of social capital (Sandefur and Laumann 1998) are themselves more or less central during different episodes of the innovation process. For example, creating solidarity among the project team is important during agenda formation, and information sharing across the wider organization is important during design. The model we propose may be a helpful tool for managers, encouraging them to focus on the kinds of networking activity that are more likely to facilitate successful innovation. While focusing on different types of networking activity will not guarantee project success, it is likely that ignoring them will almost certainly guarantee failure.

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