IMPROVING THE CONDITIONS FOR KNOWLEDGE SHARING WITHIN CONSTRUCTION FIRMS

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ABSTRACT

Successful knowledge sharing depends on the opportunities people obtain to get connected and to interact and on the willingness of these people to exchange their knowledge with each other. Thus, knowledge-intensive organizations have to create and sustain an environment that encourages and is open to the exchange of knowledge. This paper reports on research about conditions conducive to such an environment in construction firms. The cases of a Finnish and Dutch contractor reveal that although exchange conditions might be favorable in general, at the operational level knowledge sharing is quickly seen as additional work without immediate benefit to ongoing projects. It is concluded that the project-based work of construction firms specifically calls for conditions such as commitment, egalitarianism and appraisal through which knowledge sharing may become a part of day-to-day practice. Allocating time for collaborative work in strategically-selected projects, showing trust in people's capabilities to solve problems and giving feedback on the usage of provided exchange opportunities may facilitate the emergence of these conditions.

KEYWORDS

knowledge sharing, exchange conditions, construction firms, case studies.

INTRODUCTION

One of the major characteristics of construction is the dependency of constructional tasks on clients and locations resulting in (more or less) changing project requirements. In order to respond quickly and accurately to these variable environments, construction firms have to be able to use and combine the knowledge gained in previous and ongoing projects to successfully configure building and construction processes. Moreover, knowledge once created can be deployed at lower cost in future projects (Gibbert and Krause, 2002), and access to knowledge from different sources facilitates the development of innovative solutions (von Krogh, 2003). Thus, an effective knowledge flow across individual and organizational boundaries and into project practice and routines becomes essential for the competitive position of construction firms in today's business.

As knowledge resides within individuals, however, the exchange of experiences, ideas and thoughts between people depends on the knowledge-sharing behavior of these people or,

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more specifically, on their willingness to exchange knowledge (Bock et al., 2005). Moreover, for knowledge to be transferred, a source and a recipient have to enter into a dyadic relationship (Szulanski, 1996); knowledge sharing thus depends on people's opportunity to get connected and to interact. Consequently, construction firms have to create and sustain an environment that encourages and is open to the exchange of knowledge. This seems to be particularly vital due to the project-based nature of construction through which people from various disciplines only temporarily work together and often differ between projects. Discontinuities in the flow of personnel and information across and even within projects form additional barriers to knowledge exchange and learning associated with the tendency to "reinvent the wheel" (Bresnen et al., 2003).

This paper reports on research about conditions that enable an environment conducive to knowledge sharing within construction firms. The research focuses on factors of the intra-firm level influencing the opportunities for and intentions of organization members to exchange knowledge. The research's basic assumption is that knowledge sharing cannot be compelled but can only be supported (Bock et al., 2005). The paper presents the results of a literature study on knowledge sharing in organizations which structures the theoretical background and the results of previous research. Furthermore, it discusses the results of two case studies, a Finnish and a Dutch contractor, to provide insights into conditions for and possible improvements of knowledge sharing in construction firms. It concludes with some practical recommendations.

THEORETICAL BACKGROUND

ASPECTS OF OPPORTUNITY AND MOTIVATION IN KNOWLEDGE SHARING

With the shift from natural to intellectual resources, knowledge has become a strategic asset and a potential source of competitive advantage for many organizations in different industries (Hansen et al., 1999; Cabrera et al., 2006). Not surprisingly, in recent years large investments in the development and implementation of knowledge management systems have been made with the primary aim of leveraging the personal knowledge of employees (Davenport and Prusak, 1998).

According to Hansen et al. (1999), organizations can follow two basic strategies for managing their organizational knowledge: codification or personalization. Organizations that pursue a codification strategy make a one-time investment in a knowledge asset and then reuse it many times. They codify knowledge extracted from the person who developed it and use electronic databases to store this explicit knowledge and disseminate it throughout the organization for repeated application (Hansen et al., 1999). In contrast, organizations which choose a personalization strategy link people through networks in order to facilitate personal contacts and face-to-face conversation (Hansen et al., 1999). Here the exchange of tacit knowledge is the main objective.

Although Hansen et al. (1999) emphasize that effective firms focus either on codification or personalization, the success of both strategies strongly depends on the opportunity and the willingness of organization members to share their knowledge with others. The opportunity to share exists when people can interact and communicate, when information can flow and interpersonal relationships can be developed. The willingness to share refers to the

motivation aspects of knowledge-sharing behavior. There are situations where opportunities are provided but a person may not be willing to share, and vice versa. However, we believe that both factors need to be considered when putting either knowledge strategy into practice.

Organizations that pursue a codification strategy mostly stress the opportunity aspect of connecting people with other people by making use of advanced information and communication technologies such as groupware and intranets. Yet the mere implementation of IT systems neglects the fact that for codification to be effective, employees have to make their knowledge explicit and available to be stored in electronic repositories. Or as Davenport and Prusak (1998) state: "Technology alone won't make a person with expertise share it with others. Technology alone won't get an employee who is uninterested in seeking knowledge to hop onto a keyboard and start searching or browsing" (p. 142). The importance of people's willingness to provide knowledge for the effectiveness of codification stems from the social dilemma that electronic repositories as public goods create (Connolly et al., 1992). Repositories are fed by the contributions of some organization members, but each member of the organization may benefit from this knowledge provision whether or not a contribution was made. These shared resources may, thus, incline people to free ride on the contributions of others (Cabrera and Cabrera, 2005). Consequently, apart from appropriate IT systems, codification requires conditions that encourage people contributing to the accumulation of shared knowledge and decrease the likelihood of hoarding knowledge.

Personalization strategy, on the other hand, intends to leverage tacit knowledge which is difficult to articulate. Tacit knowledge is exploited and transferred first of all through a concrete situation, problem or question which allows a person to reflect on and make sense of her/his experience (McDermott, 2002). Von Krogh (2003) argues that this confrontation of one's own experience with the learning context of a person who will use the insights not only facilitates the knowledge flow from the source to the recipient but also re-creates the knowledge base of the expert. That is, effective personalization requires the development of a shared system of meaning resulting in collective change in cognition and action both of knowledge source and knowledge recipient; or as McDermott (2002) put it: "To share knowledge we need to think together" (p. 8). Thus, the opportunity to share increases, if people spend more time and work more closely together to discuss problems, to reflect on their experiences and to develop their relationship. However, the extent to which organization members engage in social interaction depends on the expected reciprocity such behavior may bring about (Cabrera and Cabrera, 2005). If, for example, people expect that investments in expertise or authority are more beneficial to their future prospects and career within the organization than mentoring or helping others, they will attempt to separate their working areas from other disciplines and to share as little knowledge as possible (von Krogh, 1998; Bock, et al., 2005). Moreover, in searching to maximize their own utility these people may try to capture knowledge from peers while hiding their own learning process (von Krogh, 2003). It becomes apparent that for the successful application of personalization strategy again conditions are needed that give organization members opportunities for intensive social interaction as well as stimulate and motivate these people to share what they know with other.

CONDITIONS FOR KNOWLEDGE SHARING

Based on the previous section it can be argued that conditions conducive to knowledge sharing in organizations open up and increase the opportunities for communication and interaction and motivate organization members to engage in the transfer of knowledge. In the following such conditions extracted from literature are illustrated.

Commitment

Organizational commitment may be defined as "an individual's psychological bond to the organization, including a sense of job involvement, loyalty, and a belief in the values of the organization" (O'Reilly, 1989). Committed persons are willing to exert extra role behavior on behalf of the organization, as the organization stands for something they personally value (Erez, 1997). Thus, it is argued that committed people are more likely to engage in knowledge-sharing behavior (Cabrera et al., 2006).

Trust

Trust underlies most social relationships, as it reduces uncertainty about the behavior of other people (Jones and George, 1998). The level of trust that exists between organizations, organization units and members is therefore expected to considerably influence the knowledge flow between people of organizations (De Long and Fahey, 2000). If, for example, a knowledge source is not trustworthy, transfer will hardly be initiated and the source's advice is likely to be challenged and resisted (Szulanski, 1996). Trust is a condition that may compensate for the lack of knowledge (von Krogh, 1998).

Appraisal

Acknowledging and rewarding knowledge sharing may be a strong signal to organization members as to what the organization values. If people are not rewarded based on their individual performance and expertise but on the extent they educate and help their colleagues, knowledge sharing will become an integral part of their work and will not be seen as costly and time-consuming activity (Cabrera and Cabrera, 2005). If appropriate, recognized knowledge exchange will then be regarded as supportive to career success instead of as a threat of loss of power or authority. Similarly, people will be more inclined to share knowledge, if this behavior is supported by supervisors and peers (Cabrera et al., 2006).

Fairness

Fairness reflects "the perception that organizational practices are equitable and neither arbitrary nor capricious" (Bock et al., 2005, p. 94) and will create higher levels of trust. The willingness of organization members to share knowledge is likely to increase if they perceive management's decision to be fair (Cabrera and Cabrera, 2005). For example, the perceived fairness of an organization's reward system is seen to play an important role in motivating people to exchange knowledge (Flood et al., 2001).

Egalitarianism

Another condition conducive to knowledge sharing is an egalitarian work environment. It is argued that in organizations where no information gap exists among people, status barriers

are removed and employees are involved in decision-making and act on equal terms, knowledge can flow more easily through the organization (Robertson and O'Malley, 2000; Cabrera and Cabrera, 2005). This also includes that sensitive topics can be discussed and that there are no feelings of intimidation due to high levels of expertise that prevent people from communication (Garvin, 1993; De Long and Fahey, 2000).

Repositories

Electronic repositories represent opportunities for sharing explicit knowledge. They capture and hold information that can be easily accessed and used by organization members. This may include descriptions of best practices, customer information, lessons learned, sales reports and technical manuals (van den Brink, 2003).

Routemaps

Unlike repositories, routemaps do not store knowledge but point to its source, which may contain both tacit and explicit knowledge. As such, routemaps help people find experts within the organization, offer links to documents or access to learning material and can extend the opportunities for knowledge sharing to external sources such as business alliances or industry associations (van den Brink, 2003).

Platforms

Platforms provide opportunities for more intensive communication and collaboration regardless of time and geographic location by improving communication and coordination between organization members, units or teams (van den Brink, 2003). Platforms are thus also suitable for exchanging tacit knowledge.

Communities

Communities are characterized here as groups of people bonded through "shared norms, traditions, identity, and solidarity" (von Krogh, 2003, p.376). They connect people with common interests and allow them to thoroughly discuss shared problems and critically reflect on them (van den Brink, 2003).

Slack

In order to interact, reflect on, deliver and exchange knowledge, organization members need time (van den Brink, 2003). Knowledge sharing will be difficult when "employees are harried or rushed; it tends to be driven out by the pressure of the moment. Only if top management explicitly allocates employee time for the purpose does learning occur with any frequency" (Gravin, 1993, p.91). Slack is a further enabling condition for knowledge sharing.

Below the results of two case studies are used to find answers to the questions: What are the conditions for knowledge sharing in construction firms and how can the exchange of knowledge in these firms be improved?

CASE 1 – KNOWLEDGE SHARING ON THE UNIT LEVEL

The first case organization is a regional business unit of a Finnish company. The company is divided in three business segments: Building Systems, Construction Services and Industrial and Network Services. The entire firm has about 22 000 employees of which about 5 000 employees work in Construction services. The Construction services segment is divided into 9 business units. The unit under investigation has about 100 employees. The main business activities of the unit include the building, reconstruction and maintenance of buildings. They have increased dramatically the amount of own production in two years and now the share of competed contracts is only 40% of the work. The case study focuses on conditions of knowledge sharing on the unit level and mainly in the competed contracts. There were three sets of interviews and several meetings during four years (2003-2006). The main interview set consisted 10 theme interviews with employees from different disciplines and hierarchical levels. The interviewed persons involved 1 executive manager, 2 project managers, 1 planning engineer, 1 estimator and 5 site managers. The evidence gathered from the interviews, documents and observation was analyzed for patterns and themes. These patterns and themes were then grouped together to build the description and interpretation presented below.

The employees of the unit are committed to the projects they are working in. The interviewees are most often willing to work overtime if needed. The office people were simultaneously involved in many projects. The site personnel worked hard to find solutions for the design problems. They actively proposed solutions also for project managers. The interviewees talk often about taking the responsibility.

Internally the employees trust all the co-workers and superiors. Trust is seen in our interviews as a challenge in the external network. The interviewees claim that in the construction industry collaborators simply cannot be fully open: the mistakes are not openly talked e.g. difficulties to keep the timetable. However, the site personnel believed that the designers or suppliers try to do their best and have enough knowledge to complete the given tasks.

On the firm level they are testing new ways of rewarding employees that effectively share knowledge in the organization; also it is studied how contracting forms can support rewarding knowledge sharing in the supplier network.

There are plenty of ICT tools that support knowledge sharing: repositories e.g. project databanks with all the drawings and documents, electronic checking of the bills, routemaps in the Intranet to find the needed information, and platforms e.g. for discussions to share tacit knowledge. It looks like that when the development of ICT happens centrally in the head quarters the regional units are happy of that but are rather critical in implementing some of the new methods. One reason for this is that it is difficult to find time learn to use the new system. The other reason is that the traditional ways of sharing knowledge are seen as more effective. The site personnel favored face-to-face contacts or phone calls in everyday situations.

The unit has arranged several types of meetings where they pursue to find solutions for the existing common challenges. Meetings in beautiful locations outside the normal facilities improve the atmosphere of knowledge sharing. On the firm level they have a history of using communities of practice: first, they had communities of specialists, e.g. a community of

estimators; after that they formed communities of processes e.g. a community of tendering. In these communities several specialists studied the process together. Now they are implementing the proposals of that work.

The interviewees thought that the firm in general and the construction project network in particular fair. The unit gives similar support to all sites and the discussions of resource sharing are open. Though, the knowledge sharing between the regional units is supported there is competition internally between the units. Sometimes feelings of unfair judgments cannot be avoided when the resources and conditions differ in each region and project.

Since the regional unit is small there are very small barriers between the site workers and the management of the region. All the people are involved in decision-making at sites. The sensitive topics – like the skills of people – can be discussed. The process of a competed project is nowadays organized so that the site manager is already part of the tendering team, if not possible the superior of the site manager is however part of the team. The site manager is also responsible of the scheduling and other preparation of the site, and site operations.

In the case unit the conditions for knowledge sharing are excellent. The basic question is how to provide time for knowledge sharing and development of work at the operational level. The unit is pursuing to finish the projects with extremely tight timetables – it forces everybody to concentrate on the most important tasks and knowledge sharing is not always seen as a key task. The knowledge sharing between projects and sometimes even in the project did not always happen unless demanded, for example, by requiring information via emails and circulating that information or arranging meetings where the employees had to come to spend time with each other. Despite of having a favorable environment for knowledge sharing in general, there seem to be difficulties in sustaining this environment on the operational level. Thus, our second case is focusing on knowledge exchange during the daily work processes in a construction firm.

CASE 2 – KNOWLEDGE SHARING ON THE PROCESS LEVEL

The second case concerns also a regional business unit but one of a Dutch contractor the core business of which is foundation work, hydraulic engineering and road construction. The entire firm has about 2100 employees and is divided into 9 regional business units which offer similar range of services. The business unit under investigation has about 120 employees. Its main business activities include the building, reconstruction and maintenance of roads, sidewalks, premises and sewage water systems. Nearly 70% of the work the business unit delivers is traditionally procured. The case focuses on conditions of knowledge sharing during this traditional construction process. The data were gathered through 16 semi-structured interviews with employees from different disciplines and hierarchical levels. The interviewed persons involved 3 executive managers, 3 project managers, 3 planning engineers, 3 estimators and 4 site managers.

Typically, within the examined organization the internal process of construction projects traditionally procured starts with the decision to tender for advertised contracts. If the decision was made for tendering, the project documents are requested and the project is calculated based on the provided design. Besides the market situation the expertise of the calculator in terms of construction methods, resource planning and risk evaluation is pivotal for the tender price. After winning the tender a transfer meeting takes place, where the

calculator hands over the project documents to the planning engineer. Based on the calculator's work the planning engineer devises a detailed work plan and determines the way of carrying out the project efficiently. The next phase is the execution of work for which the project manager controls overall cost, schedule and quality of several projects and the site manager takes on the responsibility for on-site coordination, communication and problem solving. The construction process normally ends with the handover of the executed work to the client.

Although simplified, this process description reveals the involvement of different functional disciplines into the construction process and a number of transition moments between these disciplines which require knowledge to be shared. That is, each discipline generates knowledge which serves as input for the work of the next discipline. There are two main opportunities provided for knowledge sharing. Project files are used as repositories for exchanging explicit knowledge. They store important information about the project such as contracts, drawings or schedules. Transfer meetings are platforms that allow additionally for the discussion on problematic issues and the reflection on the construction process and, thus, the exchange of tacit knowledge. However, time pressure and workload appear to be major constraints for making use of these opportunities. The interviewed persons state a permanent time pressure in projects that lower the quality of transferred knowledge and information. Tenders are less realistic, project files are less complete and drawings are not up-to-date. Moreover, transfer meetings are less efficient; the meetings are carried out quickly, people are too late, drop out of meetings and are insufficiently informed about the project. The result is a self-energizing effect. Employees regard knowledge sharing as task they have no time for. Due to a poor knowledge exchange employees have to search for information or develop knowledge that already exists. They are occupied with additional work which in turn increases time pressure and decreases efforts to share knowledge further.

The functional division as well as the spatial separation of construction site and main office intensifies this effect. Employees mostly leave the project as soon as their task is done. As a consequence, they do not have a strong affiliation with single projects. Not surprisingly, site managers reported that calculators and planning engineers do not show much interest in projects during the execution and do not visit much the construction site. On the other hand, site managers themselves spend most of their time on the construction site and hardly show up at the main office in order to give feedback on the assumptions made by process planning.

The fact that employees experience knowledge sharing rather an additional workload than a task reducing the inefficiency of the construction process is recognized insufficiently by the firm's management. Instead of communicating the importance of knowledge sharing and stimulating the exchange of knowledge so that it becomes part of day-to-day practice, the management emphasizes the quick realization of many projects as possible. A consequence is that problems are not considered to be opportunities for joint learning. The focus is on immediate solutions which require few resources to be achieved. Often the problem is inadequately solved through which the problem owner gets the feeling of insufficient trust in his/her capabilities. In order to achieve stronger commitment and perceived egalitarianism the management has to show a more conscious behavior in terms of selecting those projects and problems being strategically important for the firm and have to free up time for cooperation between project team members to work on these projects and problems

intensely. Moreover, it seems vital to offer not only opportunities but also to evaluate their suitability regularly with users and adjust them according to their efficacy. If employees do not receive feedback on the usage of provided opportunities, it is more likely that they will perceive knowledge sharing as burden rather than contribution to their work and, thus, are less willing to engage in knowledge sharing. Besides feedback a more explicit reward of knowledge sharing may facilitate this perception change additionally.

CONCLUSIONS

At the beginning of this paper we argue that knowledge sharing is essential for construction firms due to the project-based nature of their business and that construction firms have to create an environment which on the one hand provides the opportunities for knowledge sharing and on the other hand motivates people to share their knowledge. Two case studies could underpin our argument but also reveals that the project-based work specifically calls for conditions which lead to a changed perception of knowledge sharing within construction firms. Although exchange conditions might be favorable in general, at the process level knowledge sharing is quickly seen as additional work without immediate benefit to ongoing projects. Particularly the second case shows that the motivation to use opportunities provided for knowledge exchange in projects is low due to time pressure perceived by employees. Here the challenge for management lies in creating an environment through which knowledge sharing is getting anchored in daily practice and simultaneously employees' view is prevented that exchange activities are extra and wasted work. The two cases indicate that facilitating conditions in this regard are commitment, egalitarianism and appraisal. Commitment and egalitarianism can be obtained through a more strategically based selection of projects and the provision of time in these projects to allow for intensive collaborative work. The management should show more trust in the capabilities of employees to solve problems and should not force employees to search for quick and dissatisfying solutions. Appraisal may be achieved by giving feedback on the usage of knowledge sharing opportunities and rewarding exchange activities.

A more general conclusion of our research is that challenges in knowledge sharing in project-based organizations not only concern the flow of knowledge between but also within projects. Future research should capture this internal project perspective more deliberately.

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