KNOWLEDGE MANAGEMENT PRACTICES IN SMALL AND MEDIUM ENTERPRISES IN THE CONSTRUCTION INDUSTRY

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As organizations carry out their business activities in a knowledge economy, they must do so in a competitive manner if they are to survive and remain profitable. Being able to map out the knowledge assets an organization has and how it might successfully exploit them in competitive markets, are key challenges for organizations, especially the Small and Medium Enterprises (SMEs) in the construction industry. At present, there are very few empirical studies in the construction industry that have considered Knowledge Management (KM) practices in SMEs. This paper, based on an on-going study on KM in SMEs in construction, presents some of the main challenges associated with implementing KM initiatives in SMEs. It also looks at the roles and types of Information Technologies, which might assist SMEs in their KM programmes. It documents the present and future training needs of SMEs, with regard to KM. The paper concludes that managing knowledge assets in SME is not easy. It is an integrated and complex social process, which has culture, people, finance, technology and organizational structures at its core. The paper also notes that SMEs can benefit from effective KM practices. It recommends that more research effort needs to be targeted at improving KM practices in SMEs, and that there is ample scope for empirical research in this area. Similarly, Information Technologies for KM in construction SMEs need to take account of the challenges that confront SMEs, such as finance, training leadership and commitment.

Keywords: enterprise, information technology, knowledge management, training.

INTRODUCTION

Knowledge is increasingly recognized as a key and critical source of organizational asset for competitive advantage. Due to downsizing, globalization, increased competition, the growing need to innovate, and rapid convergence in technology, an increasing number of organizations are now focusing on Knowledge management (KM) initiatives. Knowledge is seen as the combination of core skills and competencies; as well as experiences. Davenport and Prusak (1998) define knowledge as a "fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information". Knowledge originates and is applied in the minds of the knower. In organizations, knowledge is embedded, not only in documents or repositories but also in organizational routines, processes, practices, and norms. Knowledge management facilitates decision-making and consistently improves business performance.

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Table 1: A break down of participating organizations and interviewees

Number of interviewees	1	2	3	4	5	6	7	8	9	10	11	12
Number of employees in the organization	22	13	13	120	200	160	50	30	100	60	145	100
Specialization of the interviewees	A	A	A	CE	CE	A	CE	C	CE	C	C	C
Type of firm	S	S	S	M	M	M	M	S	M	M	M	M
Position held in the firm	P	P	Eng	Eng	P		Mgr	Eng	Eng	Mgr	Mgr	M.D	Mgr

A - Architect; CE - Consulting engineer; C – Contractor; S-Small(10-49empployees);
M- Medium (50-249 employees); P-Partners; M.D- Managing directors; Mgr- managers;
Eng-engineers.

The Latham (1994) and the Egan (1998) reports have suggested that the construction industry as a whole is under-achieving, with low profitability. The UK construction industry contributes about a tenth of the gross domestic product and is one of the largest employers of labour in the economy, employing 1.4 million people (DTI 2003). This suggests that the industry is knowledge intensive but could be argued to have failed to efficiently utilize the knowledge of the employees and the organization as a whole. The Construction Research and Innovation Strategy Panel (CRISP 2002), the Information Technology Construction Best Practice (ITCBP 2002) and "Rethinking Construction", view KM from people, culture, technology and training perspectives, as important for the construction industry.

The aim of the paper is to discuss some of the findings of the pilot study, which is part of an on-going PhD research on KM in SMEs in the construction industry. The paper discusses some of the main challenges associated with KM. It explores the role and the type of Information Technology, which could assist SMEs in their KM programmes. It highlights the present and future training needs of SMEs, with regard to KM.

RESEARCH METHOD

This section of the paper discusses the research method adopted for the pilot study. A pilot study allowed the researcher to focus on particular areas that may have been unclear previously (Yin, 1994). The initial time frame of pilot study allows the researcher to develop and solidify a rapport with the participant as well as to establish effective communication. The pilot study was interview-based and semi-structured in format. Semi-structured interviews provide some flexibility and it is one of the ways to obtain a realistic picture of an individual's view (McCormick and Hill 1997). The interviewer can keep the respondent interested and make sure that the respondent has understood the questions and the purpose of the research (Oppenheim 1992). The interviews in the pilot study reported in this paper lasted between thirty minutes and one hour. Interviews were taped and later transcribed.

All the organizations that participated in the pilot study employed more than 10 people but less than 250 employees. The sources from which the organizations were drawn include the database from the Centre for the Built Environment (CBE), Glasgow, Scotland. Those interviewed were also used as informants to identify other members, who could be interested in participating in the pilot study.

In all, the survey was piloted with 11 organizations involving a total of 12 practitioners/interviewees. The number of employees from the participating organizations varied from 13 - 200 (see Table 1). The sample consisted of four architects, four consulting engineers and four contractors. The period of study was from 25th Feb to 11th April 2003, in Glasgow, Scotland, UK. Interviews with personnel across organizational hierarchy allowed some insights at organizational, group and individual levels to be gained.

As part of the analysis of the interviews, content analysis was employed. Content analysis is a research tool that can be used to determine the presence of certain words or concepts within texts or sets of texts. Researchers undertaking content analysis quantify and analyse the presence, meanings and relationships of a number of actions, which although different, may be very similar in purpose; and several words or phrases may have similar meanings. The boundaries of categories are to be established (Fellow and Liu1997).

Analysis can be done manually or through the use of various computer programs. There are a large number of computer programs available for content analysis, such as NUD*IST, ATLAS/ti, and Code-A-Text, to mention a few. The pilot study involved only twelve interviews and it was decided to analyse these manually. The main study for the PhD will involve more interviews and the data from this would be subjected to a more rigorous analysis using appropriate software.

MAIN CHALLENGES ASSOCIATED WITH KNWOLEDGE MANAGEMENT IN SMALL AND MEDIUM ENTERPRISES

Knowledge is a complex concept which consists of information and skills acquired through experience; truth and belief, perspective and judgements, expectations and methodologies. Knowledge exists in individuals, groups and in organizations, in various forms. Many authors have defined KM from different perspectives. For the purposes of this study, KM is defined as a process by which knowledge is identified, created (acquired/ captured), codified, stored, disseminated (shared/ transferred), implemented (adapted, transformed, synthesized) and measured for the benefit of an organization. This section discusses the challenges for KM sub-processes that consist of knowledge capture, dissemination and creation.

Knowledge Capture
Brooking (1996), states that only 20% of knowledge available to an organization is actually used. It leads to intuitive thinking of about the remaining 80% of the employee's knowledge. Hence the capture of employees knowledge is vital for the organization, especially key decisions, made based on experience and information which is usually shared informally. In SMEs, the attempts made to transform tacit knowledge into explicit knowledge are, in the main unsuccessful. The ability to survive and thrive relies to some extent, on an organization's ability to maintain and retain old and new knowledge in the face of complexity, uncertainty and rapid change.

It seems the case, that the importance of the employees knowledge is often realized, perhaps too late, when the employee is about to leave the organization, as he/she prepares to take with him/her knowledge and experience gained over the years. In the pilot study 8 out of 12 interviewees (67%) agreed that knowledge capture was a challenge. Some of the mechanisms for knowledge capture, in the organizations interviewed, included formal meetings, were meetings are minuted and circulated, and

Table 2: The extent to which the knowledge management sub-process is a challenge

No.	Knowledge Management Process	Percentage of response (extent to which the knowledge management sub-process is a challenge)
1	Knowledge capture	67%
2	Knowledge dissemination (transfer and sharing)	50%
3	Knowledge creation	17%

central database for capturing project reviews. The interviewees also revealed instances were members of staff had to submit reports after attending external seminars and exhibitions. Two out of the eleven organizations produced newsletters twice a year. The tacit knowledge that is difficult to codify is shared, captured and transferred through telephones, mobile phones and informal face to face meetings. Tacit knowledge is also shared through brainstorming and mentoring schemes in many of the SMEs interviewed for pilot study.

Barchan (1999) suggests that the organization loses more than the people knowledge, e.g. investment made for professional development and competence, when a staff leaves an organization. When the employees leave the organization, the co-employees temporarily maintain the position until another person is recruited.

Knowledge Dissemination

Knowledge dissemination consists of knowledge transfer and knowledge sharing. In the study, 6 out of the 12 (50%) of the interviewees agreed that knowledge dissemination is a challenge. Lack of time, lack of communication skills and rapid change in Information and Communication Technologies (ICT) are highlighted as some of the main concerns for knowledge dissemination. The element of trust plays an important role in knowledge dissemination. Edvinsson (2002) stated that trust ties together an attentive system, which forms the collective mind required for reliable performance. Trust is considered important for knowledge dissemination, as stated by some of the respondents. Face to face discussions are an important way of knowledge dissemination.

Knowledge Creation

Knowledge creation is a process of value addition to previous knowledge through innovation (Duffy 1999). One of the interviewees involved in the pilot study put forth his thoughts as follows: ***"If the organization did not create new knowledge, it would not survive".*** New skills and competences of the employees have a vital role for the survival of an organization. Four out of twelve (33%) interviewees noted that knowledge creation is a learning curve for the individual as well as organization. It is also accepted that knowledge creation is a challenge, which to some extent could be seen as an indication of the lack of resources in SMEs to identify and use important external sources of scientific expertise and advice (Rothwell and Bessley 1992) in generating new knowledge. There were factors gleaned from the interviewes which suggested that information overload and time are two main constraints for knowledge creation. Table 2 indicates the extent to which Knowledge management sub-process is a challenge.

Managing knowledge assets in SME is not easy. Knowledge management is an integrated and complex social process which involves culture, people, finance, technology and organizational structures at its core.

Table 3: Insight into the current technology for KM in the SMEs

Technology	Telephones	E-mails	Internet	Intranet	Fax	Website
KM use	12	6	3	3	2	-
IT/ICT currently available (in place)	12	12	7	3	7	9

The next section focuses on the role and type of information technology that are currently used for the main sub-processes of KM.

ROLE AND TYPE OF INFORMATION TECHNOLOGY

Information Technology (IT) supports the collection, storage, processing and communication of information by electronic means (Armstrong 2001). Knowledge management technologies require IT infrastructure and skills.

The primary focus of KM is to identify, create, capture, disseminate and implement the knowledge of the organization to help the right people apply the right knowledge at the right time. Corporate intranet is an efficient tool for the storage and flow of knowledge within an organization. Bennett and Gabriel (1999) suggest that intranet can improve company decision-making, quicken employee responses to enquiries about products, which can lead to innovation. Table 3 presents the current technologies used for KM in SMEs, as noted in the pilot study. Three organizations used intranet for knowledge identification. This is basically a data warehouse with data on previous projects and employees (those involved in projects, together with their skills and competencies). Three of the organizations use internet for sharing information and some of their knowledge assets. Six of the organizations use E-mail to share knowledge and ideas across the organization, and externally with clients and customers. E-mail is mainly used as a means of communicating information and knowledge widely. E-mails in SMEs, are an important enabler of knowledge transfer, especially across organizational boundaries, rather than within the organization. Telephones are very much used for knowledge sharing and transfer.

The above indicates that SMEs are using the basic information communication technologies to affect KM. The main study of the PhD programme hopes to investigate the efficacy of these technologies for different types and context of "knowledge use".

The IT infrastructure in the organization provides the platform upon which KM solutions are built. It is clear from Table 3 that there is some scope to exploit the varied IT software and hardware for KM in SMEs. Lees and Lees (1987) state that small firms do not undertake adequate planning for their use and operation of IT. Bergeron and Raymond (1992) argue that IT can be used as a strategic weapon by small firms to maintain their competitiveness and attain a favourable position within the sector of activity. Small firms depend on external IT expertise in the form of consultants and vendors (Thong *et al.* 1994). This was evident in the pilot study as nine of the eleven organizations had websites hosted by consultants, mainly for the purpose of marketing. Most of the organizations in the pilot study have not updated their websites from when it was hosted. This indicates that organizations, especially SMEs, do not fully exploit the potential benefits of IT for KM (Egbu and Botterill 2002).

SMEs use various software packages bought off the shelf or software products given to them by software distributors. Two out of the twelve (17%) interviewees noted that

their organizations have invested in IT software and are not reaping the benefits of it, as it requires training and the sharing of the knowledge by the employees who use it. Microsoft Office and AutoCAD packages are used by 11 out of the 12 (92%) interviewees, for codification and transfer of explicit knowledge within and across the organization.

The main benefit of IT appears to be faster transmission of information. Information technologies for KM in construction SMEs need to take account of the challenges which confront them, such as training and finance. Four out of the twelve (33%) interviewees noted that training was needed for IT for KM. Three of the twelve (25%) of the interviewees revealed that there was information overload using the technologies, especially with Internet and Intranet. Faxes were frequently used for transfer of explicit knowledge in two of the eleven organizations. Only in one of the organizations interviewed, was video conferencing used as a technology for transferring useful knowledge. This suggests that SMEs in the construction industry are slow in the uptake of IT. The issues of cost of purchase and maintance; and the value reconciliation with regard to their frequency of use are important in this regard.

The interviewees were asked to volunteer information on the IT/ICT they are likely to use for KM in the future (next 5years). Three out of the eleven organizations said that their current IT infrastructure was good and do not intend to make any investment for the next five years. However, three organizations said that they plan to have wireless handheld field communication devices and be more E-mail and web (Internet, Intranet and Extranet) based in the future. Information Technology enhances, to a very significant extent, the number of people that can engage in the transfer and sharing of knowledge in organization, as well as the speed and volume with which knowledge can be processed. Without management support, proper training, leadership and a committed effort to make tacit knowledge explicit, IT for KM will remain less fully exploited in SMEs in the next 5 years.

TRAINING

The purpose of training is to improve employee's performances in their current jobs and prepare them for more demanding roles, making use of organizational knowledge as well as creating and exploiting new knowledge. Anecdotal evidence and empirical results (Curran and Stanworth 1981) suggest that the lack of training in small firms hinders growth. The results of the pilot study suggest there is paucity of training programmes, based on how to manage knowledge assets within SMEs in construction. The pilot study also revealed that there are very few formal training programmes (in-house or external) on KM directed at the needs of SMEs. Training is an important component of the KM process for SMEs. Seven organizations agreed that the future need is to focus on training for KM. Only three organizations could point to some form of in-house seminars that have really enabled knowledge sharing. Some of the organizations felt that they could not send their employees for training because it was not held in the vicinity of their organization. There are many incidental expenses (hotel accommodation, travel and meal allowances) attached to going on external training. Small and medium enterprises relate most closely and intensively to their suppliers and customers and, to a slightly lesser extent, to their competitors (Rothwell and Bessley 1992). Less frequently, SME's communicate with colleges and schools, and with some graduates from the universities. There is a need for more focus on training for SMEs, as this is important for KM in the construction industry.

CONCLUSION

The pilot study has indicated that some elements of KM is practiced but in an adhoc fashion. The effective implementation of KM in SMEs is to a large extent determined by culture, structure, people, leadership, finance and technology. Knowledge must be identified, captured, created, disseminated and used effectively to provide the best possible benefits for organizations. Any technological infrastructure that is put in place to support KM must be adapted to the organization's needs and not the other way round. Training for KM has to be taken into account as it takes time and effort to get people to accept and learn new ways of working in such a way that they are able to apply the outputs of the training with ease. An important benefit of KM is to increase the speed to the market through the re-use of proven resources and methods. The effective implementation of KM could reduce costly mistakes and ensure improved services to clients. Knowledge management enables rapid absorption and diffusion of new ideas, organizational agility, operational efficiency, and growth in core capabilities. It also enables organizational growth. Knowledge management is not about a one-off investment. It is future-oriented investment that requires consistent attention over a substantial period of time, even after it begins to deliver results. More research effort needs to be targeted at improving KM practices in SME in the construction industry.

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