

INFORMATION TECHNOLOGY TOOL FOR BUILDING KNOWLEDGE ASSETS FOR THE SMALL MEDIUM ENTERPRISES

CYNTHIA CHINTIAN LEE¹, CHARLES EGBU¹, DAVID BOYD², HONG XIAO², EZEKIEL CHINYO²

¹School of Built and Natural Environment, Glasgow Caledonian University, G4 0BA

Email: leec@gcal.ac.uk

²School of Property and Construction, University of Central England, Perry Barr, Birmingham, B42 2 SU

ABSTRACT

In this knowledge driven global economy, knowledge itself can be seen as a commodity that offers the only 'true sustainable competitive edge'. If knowledge is effectively managed i.e. collected, structured and disseminated, it will bring significant benefit to organisations, with potential benefits to the wider construction industry. There are a plethora of knowledge management tools and solutions on the market. However, the increasing attention of knowledge management is unsurprisingly targeted at very large multinational organisations, with little at the small medium enterprises (SMEs); and even less at construction-related organisations. With over 99% of the construction industry in the UK made up of SMEs, these organisations are in need of knowledge management just as much as large enterprises in order to stay competitive. This paper presents and discusses some of the findings from an on-going 18-months project, funded by the UK Department of Trade and Industry (DTI). The research project adopts the use of IT in assisting SMEs to build their knowledge assets through capturing their learning experiences, explicate the significant knowledge embedded in the participants' experiences; and transform it into knowledge accessible to a wider audience. In addition, the challenges participants face in their knowledge capture process will be highlighted. The paper will also reflect on the role of information technology (IT) in knowledge capture and communication in SMEs. Conclusions and recommendations for practice and for academia are documented.

Key Words: Knowledge Assets, Knowledge Management, Small Medium Enterprise,

INTRODUCTION

Knowledge resides in many different places such as: databases, knowledge bases, filing cabinets and people's head. It can be seen as the entirety of cognitions and abilities, which are used by individuals to solve problems. This comprises theoretical perceptions as well as pragmatic day to day rules and guidelines and is an organised set of statements of facts or ideas, presenting a reasoned judgement or an experimental result. The construction industry is essentially an information processing industry (Aish, 1999); where most knowledge comes from the successful completion of projects (Conheeny et al, 2000). With the increasing

pressure for competitiveness on construction organisations, it is necessary to capture, transfer and reuse project knowledge and use lessons learned from previous projects to improve project performance. Given the complexity of construction-related projects and organisations, cross-boundary knowledge transactions are of growing importance and the onus on fragmented organisations to share knowledge to deliver solutions is necessary. The reliance on project participants to share knowledge in order to succeed in project delivery has never been greater (Whelton et al., 2002). Thus, the need for Knowledge Management (KM) in the construction industry is fuelled by the need for innovation, efficiency, improved business performance and client satisfaction.

Transferring knowledge and information across projects is a major challenge for construction organisations. Much construction work is project-based, short-term and task-oriented, promoting a culture where continuous learning is inhibited. Specialist and technical knowledge is lost from one project to the next stifling an organisation's ability to develop knowledge and generate new ideas (Egbu & Botterill, 2002). In this knowledge driven global economy, knowledge itself can be seen as a commodity that offers the only 'true sustainable competitive edge'. Success in an increasingly competitive marketplace depends critically on the quality of knowledge which organisations apply to their key business processes. Knowledge assets are the intangible assets of an organisation such as employees expertise, knowledge regarding markets, products, technologies and organisations, that a business owns or needs to enable its business processes to generate profits, add value, etc (Kroll, 1999). The know-how and expertise of the work-force is the human capital component of intellectual capital thus, knowledge assets are also intellectual capital that an organisation owns; it is an important factor for the success of companies and strongly influences the effectiveness and efficiency of the business processes and their outcome.

In the process of building knowledge assets, enterprises need to know what their knowledge assets are and how to manage and make use of these assets in order to get maximum return. Knowledge assets can be built through effective management of knowledge i.e. collected, structured and disseminated; significant benefit to organisations, with potential benefits to the wider construction industry can be obtained through knowledge management. Knowledge management is not only about managing these knowledge assets but managing the processes that act upon the assets. These processes include: developing knowledge, preserving knowledge, using knowledge and sharing knowledge. It involves the identification and analysis of available and required knowledge assets and knowledge assets related processes, and the subsequent planning and control of actions to develop both the assets and the processes so as to fulfil the organisational objectives. There are a plethora of knowledge management tools and solutions on the market. However, the increasing attention of knowledge management is unsurprisingly targeted at very large multinational organisations, with little at the small medium enterprises (SMEs); and even less at construction-related organisations. With over 99% of the construction industry in the UK made up of SMEs, these organisations are in need of knowledge management just as much as large enterprises in order to stay competitive.

Knowledge Management and Small Medium Enterprises

Small Medium Enterprises (SMEs) are organisations that have less than 250 employees. The weaknesses of SMEs as identified by Egbu (2001) are:

- Inability to fund long-term and risky knowledge management programmes
- Weakness in specialised range of technological competencies
- Weakness in investment on training and education

The strengths of SMEs on the other hand are:

- Its less formal strategies increase the communication of knowledge, speed of decision making and improve informal networks
- Its informal network improve employee commitment and their receptiveness of knowledge management regimes
- They are also able to react faster to changing market requirements and the requisite knowledge to satisfy market needs.

Other weaknesses of SMEs as identified by Rothwell and Dodgson (1994) are that SMEs have little management experience, power imbalance if they are to collaborate with large firms, difficulty in coping with complex regulations and associated cost of compliance.

Hylton (2002) has indicated that SMEs are in need of knowledge management just as much as large enterprises. The reasons cited are that the world has changed rapidly over the past decade and continues to do so. There are more contenders for every dollar or profit, which put great pressure on companies, large and small, to innovate and to develop products rapidly. Both innovation and rapid development require accelerated use of knowledge; knowledge that must be managed efficiently, effectively and securely. To remain competitive, companies have to know something and then co-ordinate and use what they know, quickly. SMEs therefore must first know what their knowledge assets are then how to manage and make use of these assets to get maximum return.

A THEORETICAL PERSPECTIVE

Knowledge management is defined as any process or practice of creating, acquiring, capturing, sharing and using knowledge, wherever it resides, to enhance learning and performance in organisation (Scarborough et al., 1999). Knowledge management involves knowledge identification, creation, acquisition, transfer, sharing and exploitation. Knowledge management is vital for efficient working in projects and for improving organisational competitiveness (Egbu, 2000a, 2001). Knowledge management can also promote innovation and business entrepreneurship, help managing change, and emancipate and empower employees (Nonaka and Takeuchi, 1995; Egbu, 2000b; McAdam and McCreedy, 2000; DTI, 2000).

Much of knowledge management focuses on the role of information technology (IT) and information systems (IS) and the tools that aid knowledge transfer and storage (Egbu, 2000; 1999). Although IT and IS are essential requirements in 'enabling' knowledge management, the true asset of an organisation is its brainpower (Edvinsson, 2000). Intellectual Capital (IC) is recognized as a key strategic asset for organizational performance and its management is critical for the competitiveness of organizations (Roos et al., 1997, Marr et al, 2003). Three components of IC identified are human, structural and customer capital (Edvinsson, 2000; Bontis, 1998; Bontis et al., 2000). Structural capital is the internal structure of an organisation, such as its strategies, core competencies and culture, which is always context specific. Customer capital on the other hand encompasses the external intangible assets of an organisation. Customers are the principle determinants of the market position and strength of an organisation (Smith and Saint-Onge, 1996). Human capital is asserted as the most important intangible asset in an organisation, especially in terms of innovation (Edvinsson, 2000; Stewart, 1997; Roos et al., 1997; Brooking, 1996). The unique tacit knowledge of individuals is of immense value to the organisation as a whole, and is the "wellspring of innovation" (Steward, 1997). It is essential for organisations to maintain and grow their IC stocks and knowledge management is one way of helping them to do this (Brooking, 1997). Few know how to use this knowledge in a systematic way in order to gain real business benefits (Marr, 2003).

Differences between Knowledge and Information

Very often, the knowledge management is confused with information management (Sveiby, 1997). Sveiby (1997) has contended that the confusion between knowledge and information has caused managers to sink billions of dollars in information technology ventures that have yielded marginal results. He asserts that business managers need to realise that unlike information, knowledge is embedded in people, and knowledge creation occurs in the process of social interaction. Unlike information management, which in general is the conservation, sharing and recycling of information or data for specific business use, knowledge management is about people (Dougherty, 1999). A distinction made between information and knowledge by Ash (1998) and Kirchner (1997) is that information has little value and will not become knowledge until it is processed by human mind and that knowledge involves the processing, creation, or use of information in the mind of the individual. Other definitions on information and knowledge include knowledge is information combined with experience, context, interpretation, reflection and perspective (Davenport et al., 1998; Kirchner, 1997; Frappaolo, 1997). Although information is not knowledge, it is an important aspect of knowledge (Martensson, 2000). If the process of knowledge management is led by IT, knowledge can too easily become "information" or data only: to be stored and theoretically retrieved, from databases (Dougherty, 1999). Thus, it is essential that the use of IT to manage knowledge should be done ingeniously.

THE RESEARCH METHODOLOGY

The research reported herein concerns the building of knowledge assets within SME organisations in the construction industry. This is done through the process of knowledge generation, storing and sharing.

Knowledge generation - is the processes executed to increase the stock of knowledge assets. Knowledge can be generated through knowledge acquisition and creation. Knowledge acquisition is the process of capturing and bringing knowledge from the external environment into the company whilst knowledge creation is the process of developing new knowledge assets within the company (Marr, 2003). In the context of this research, knowledge generation shall only be through knowledge creation.

Knowledge storing - is the process of saving knowledge within the organisation so that knowledge can be made available anytime and anywhere. Knowledge storing can take the form of knowledge databases, in which codified knowledge is stored in appropriate information codes. This is based on the idea that knowledge can be codified and made available to be retrieved electronically and this approach shall be adopted in this research.

Knowledge sharing - is the process by which knowledge is disseminated across the organisation. Knowledge sharing can be done through formal and informal process; formal knowledge sharing shall be in the form of meetings, seminars and workshops and informal knowledge sharing shall be in the form of informal discussions between individuals in an organisation. Knowledge sharing can be supported by the use of information and communication technology (ICT) for example online databases, data warehousing/knowledge repositories and intranets. The strategy to adopt ICT is one of the most followed managerial practices within the organisations (Marr, 2003) and ICT can be a facilitator to encourage individuals to share their knowledge.

28 site managers from 12 SME organisations were involved in the study, coming from organisations that included general contractors, specialist contractors and consulting companies.

Once a week, the research participants recorded stories of problem-solving events, which they had experienced. The participants were encouraged to select events that were useful for learning; i.e., events that were challenging, successful, worrying, complicated, difficult, frustrating, or annoying.

A set of structured but open questions was provided to help the participants in recording their stories. The use of audio diaries in this task minimised disruptions to the participants' daily work, and encouraged their participation and cooperation. Nearly three hundred audio diary entries were recorded and their stories yielded rich qualitative data.

After about four diary entries, the storyteller was debriefed to analyse for learning from these stories and to provide a deeper interpretation of the events. The debriefing sessions were thus structured to facilitate the data analysis. The structuring was done with reference to principles discussed by Pearson and Smith (1985). Over ninety debriefings were conducted with the research participants.

In this research, knowledge is created by the research participants when they reflect on their experiences and record them in the event register and post project review forms. The tacit knowledge of site managers is captured initially and inadvertently through diary entries, whereby events which arise through daily operations of their work is recorded in the event register and made explicit. Issues such as circumstances underpinning the event, the feeling and actions of the participants, the reaction of other people involved in that project and the lessons learned from the event may be discussed in the event register. Similarly, at the end of a project, a post project review is done through the exploration of what contributes to the successes of the project, the problems/challenges faced and the lessons learned. The recorded knowledge in the event register and post project review is stored as knowledge database, made available and shared throughout the organisation via the intranet. Through this process, the organisation knowledge assets are built up.

INFORMATION TECHNOLOGY (IT) AND KNOWLEDGE MANAGEMENT

IT is becoming increasingly important to KM in construction organisations (Egbu & Botterill, 2002). Many organisations employ IT in one form or another to manage their knowledge and, in general, IT is used primarily to store and transfer explicit forms of knowledge. In addition, IT can also be used to aid collaboration and co-operation between people, and as tool to assist the transfer of knowledge and information between project teams, enabling the development of new knowledge for innovation. However, the construction industry has been slow to recognise the benefits of IT as a major communication tool (Egbu et al., 2001). Research (Egbu & Botterill, 2002) has shown that the most frequently used techniques and technologies in construction organisations are: telephone, Internet/intranet/email and documents and reports. These are closely followed by face-to-face meetings and interaction with the supply chain. Although construction organisations are investing more in some aspects of IT, such as the Internet, greater emphasis is put on the more conventional techniques for acquiring, developing, sharing and storing knowledge. IT should be understood less in its capacity to store explicit information and more on its potential to aid collaboration and co-operation between people (Egbu & Botterill, 2002). Dougherty (1999) argues that IT should be seen as a tool to assist the processes of KM in organisations. Communication is a vital part of organisational activity and IT has a central role to play in the communications of the organisations (Egbu et al., 2001). Although IT has been extensively used for communication in SMEs, the use of IT as a knowledge capture tool is still in arrears. This may be due to the lack of awareness of knowledge management in the SMEs; let alone knowledge capture, their financial limitation and also their weakness in education and training which hinders their skills in IT.

In this project, the building of knowledge assets is through the employment of IT. A website using Microsoft Frontpage as illustrated below is created, whereby users are able to conduct online recording of an event diary or do a Post Project Review. Under the event diary section, users are given the option to listen to events recorded by their colleagues, record an event orally using the audio diary or key in an event which they have encountered in the process of their work.

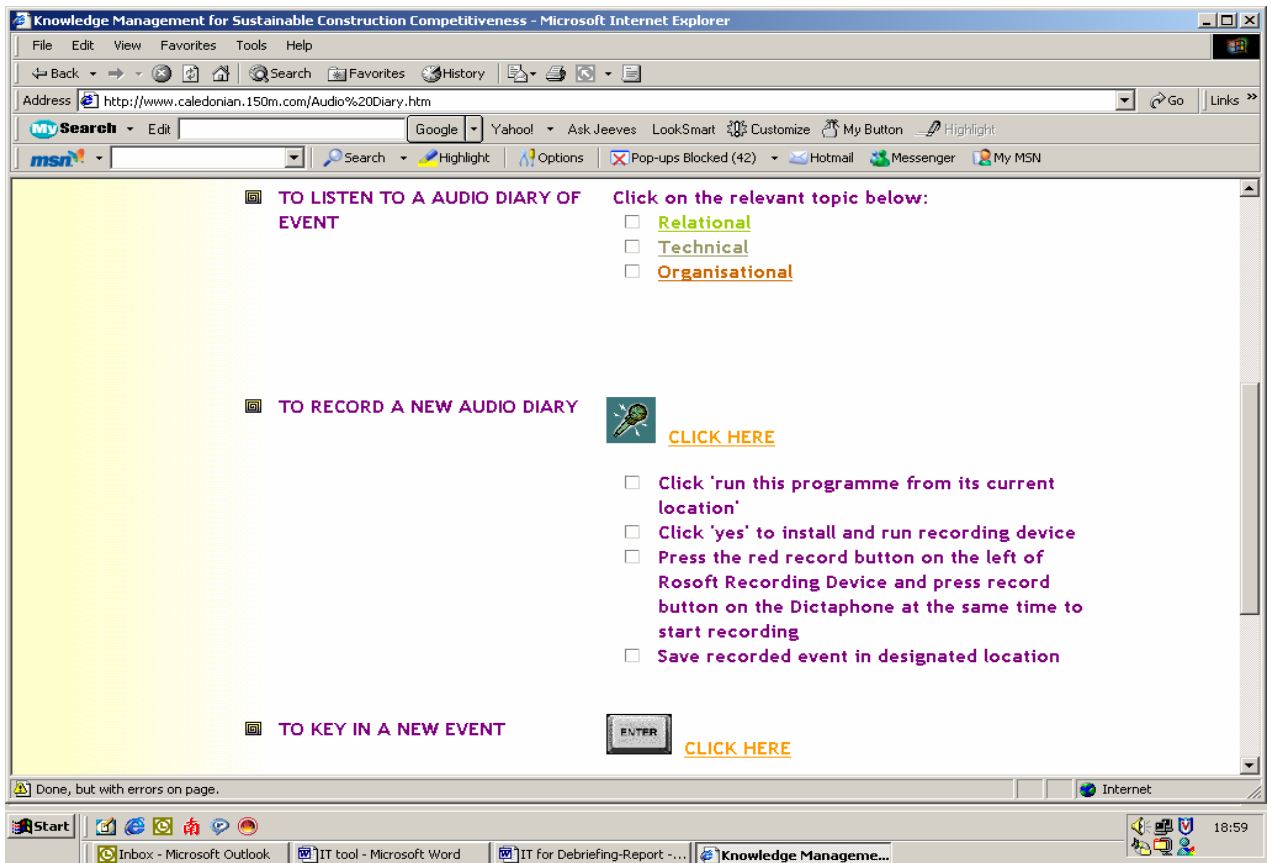


Figure 1: Screenshot of the webpage created for knowledge capture

In this project, the audio diaries recorded by users are kept under three broad areas: Relational, Technical and Operational. Users are able to click onto the relevant topic to listen to an event recorded by their colleagues. Audio Diary can be created using Rosoft Audio Recorder. This software can be downloaded free of charge from <http://www.downloads.com>. To do a recording, the software is activated and a recording screen will appear on the computer. Users will need to plug in their Dictaphone and press the record button on the Rosoft Audio Recorder as well as on the Dictaphone and the events can be recorded and saved into their company database. Upon creating the above said audio diary under different topic, it will be stored in the database where users can select to listen to the audio diaries of their colleagues and learn from their experiences by simply clicking the appropriate button on the relevant topic and the audio diary will be played. Next, to key in an event and create an

event database, Microsoft Access is used (see Figure 2 for an illustration of the database). A link is created on the website and users will need to click on the ‘ENTER’ button and download the file to key in the event.

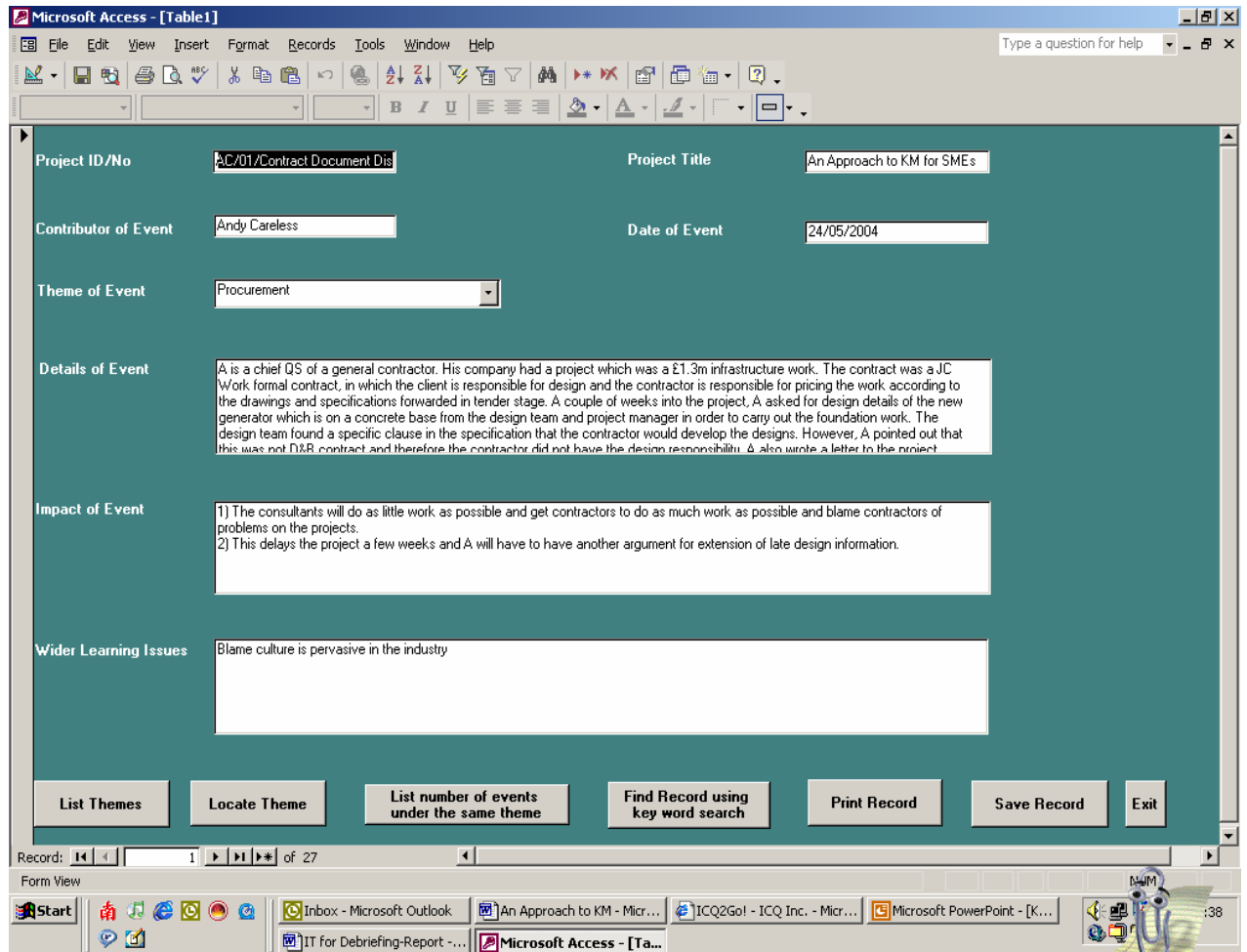


Figure 2: Screen shot Event database

Similar to the event database, users can also create a database for post project review which enables users to evaluate projects and learn from them (an illustration of which is shown in Figure 3). This will enable project information to be captured, retained, indexed so that people external to the project can retrieve and apply it to future tasks/projects. By reviewing projects, it will prevent ‘re-inventing the wheel’ and repeat mistakes.

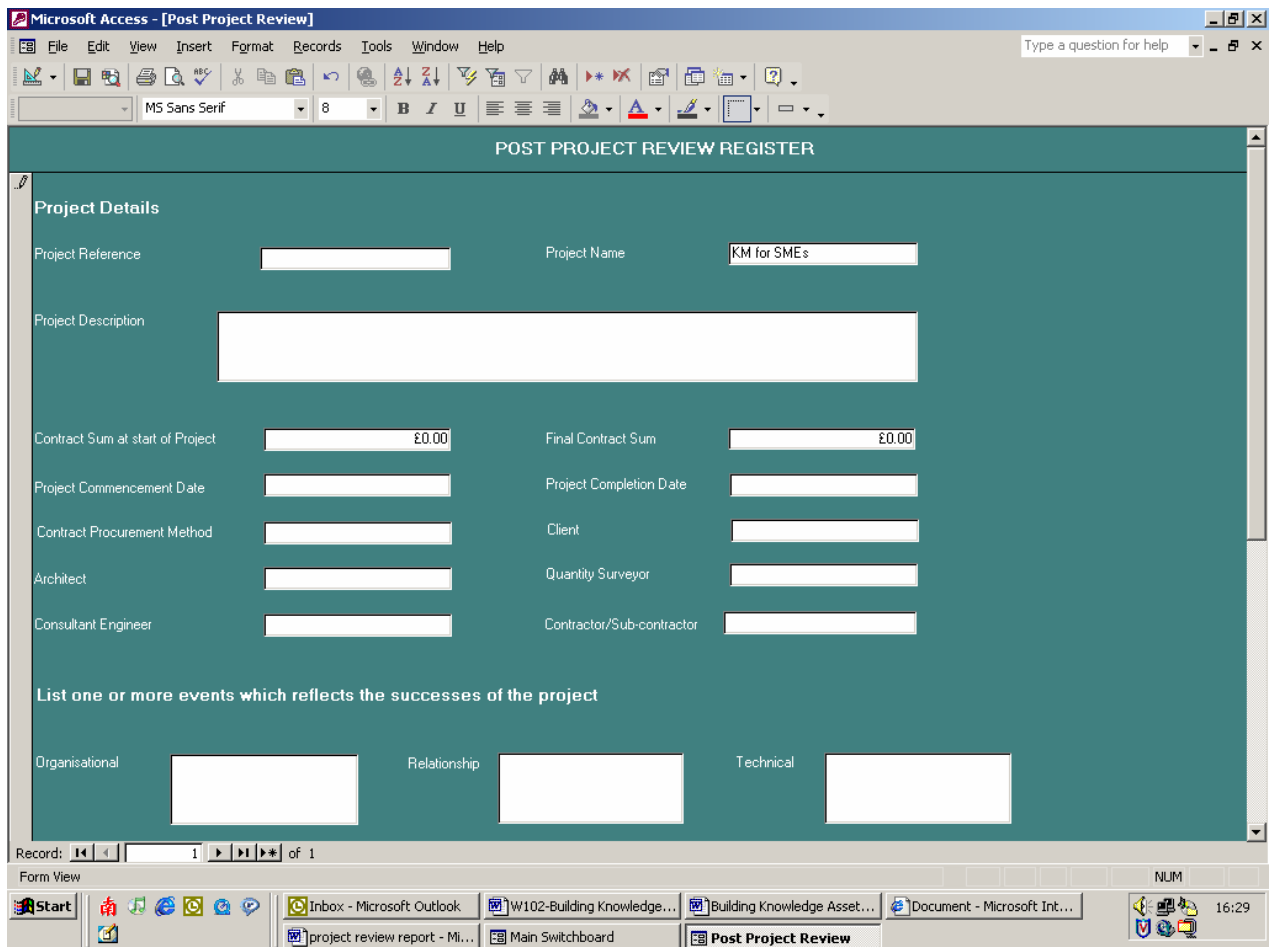


Figure 3: Screen shot of Post project Review

Compared to the audio diaries created using a Dictaphone, the advantages of this web based knowledge capturing tool are that the details of the recorded events are clear, easy to read and can be printed out to make reference to. Listening to events recorded using the Dictaphone on the other hand, may be difficult when the person who records the event does not speak clearly and the listener has to listen to the event over and over again to make out the content.

CHALLENGES FACED BY PROJECT PARTICIPANTS

Along with the benefits of knowledge management many barriers exist, thus turning the management of knowledge into a very challenging task to do. A barrier can be considered to be 'Everything related to human, organisational and/or technological issues that obstructs the intra- and inter-organisational management of knowledge' (Wunram et.al, 2000). Therefore, these barriers can basically be allocated to the TOP (Technology, Organisation, People) categories of socio-technical systems classification (Thoben, 2002).

From our research the challenges participants faced in their knowledge capture process are identified as below:

Technology

As discussed earlier, SMEs are weak in specialised range of technological competencies. The technologies employed in their knowledge capture process are also usually equipments used in their day-to-day running of their tasks. Although attempts may have been made to capture knowledge, no advanced or innovative technologies are roped in to help in the process.

Organisation

There is a lack of awareness of knowledge management strategies and instruments in the SMEs that participated in the study. The necessary awareness for the management of knowledge is relatively low among the responding companies. There is a lack of knowledge capture strategy in place and no company had an explicit knowledge management strategy implemented, nor determined corresponding responsibilities. Very often, employees are not aware of the knowledge capture process and often look for quick fixes in their work to fight the symptoms of a problem and not its cause, thereby missing the opportunity to record their experiences and let alone transferring their knowledge amongst the staff. When questioning why people tended to look for quick fixes instead of lasting solutions, efforts related to time and costs were almost always mentioned. Although SMEs may be aware of the power of knowledge management and the importance of knowledge capture in their organisation, they often feel that they have other more pressing priorities and needs. In addition, knowledge capture may be seen as a 'big boys' thing or even as a fad that only big companies can afford to indulge in.

People

Communication barrier was mentioned to be a problem when dealing with people. A common problem in this context occurs when two colleagues of the same company and are involved in the same project but belong to different domains. The understanding of what they are talking about can be significantly different. Although SMEs may have a less formal communication channel, the barrier of idea robbery still exists; the fear that the idea of an individual employee could be taken by another who then gets the acknowledgement and rewards for that idea. Thus, there is a need for the protection of proprietary knowledge among employees and this hinders knowledge transfer and capture. Another barrier that SMEs faced is finding the time to capture knowledge. People are overstretched and the knowledge capture process may impact too much in their activities.

CONCLUSION AND RECOMMENDATION

Knowledge is rapidly becoming the most important asset of virtually all organisations and organisations in the construction industry are no exception. The ability to manage and exploit knowledge will be the main source of competitive advantage for the construction industry of

the future. Knowledge management may help SMEs develop for the future and have more sustainable business practices, making them less vulnerable to the economic cycles of the industry.

Knowledge sharing will minimise the knowledge loss that will result in the event of a straightforward transfer of tacit knowledge to explicit forms. McDermott (1999) argues that IT tools alone cannot effectively perform knowledge conversion, unless certain other conditions such as trust, face-to-face contact, time to interact between participants and creation of a common language are in place. Outlined above are the challenges faced by SMEs in knowledge capture. In order to bring knowledge management to its next lap, SMEs need to look into their work procedures and incorporate the knowledge capture process into it. In addition, SMEs also need to be able to identify their sources of knowledge in order to be able to capture it. For SMEs to implement knowledge management system, investment on education, training and infrastructure need to be increased. Like large companies, SMEs should take action to capture and store the existing tacit knowledge within the company.

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