ONE SIZE DOESN'T FIT ALL: USING TECHNOLOGY TO SUPPORT A BALANCED KNOWLEDGE MANAGEMENT INITIATIVE

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In an increasingly competitive construction industry, the role of innovation has become a key factor for firms wishing to sustain their competitive advantage. Indeed, over the last decade an emphasis on innovation has replaced efficiency and quality as the main source of competitive advantage, and a pre-requisite for success and survival for numerous organisations. It is this requirement for construction firms to become more innovative and maximise the use of their resources that renders knowledge as a key organisational asset.

There is now a general consensus across the industry and academia that knowledge is a vital organisational and project resource. However, construction firms have experienced difficulties in implementing effective Knowledge Management (KM) initiatives, with only a handful of firms realising KM success. KM literature highlights the need for balanced KM approaches incorporating people, process and technology-orientated solutions. The aim of this paper was therefore to examine the successful approach taken by a multi disciplinary engineering design consultancy, in implementing KM-supporting technology to sustain its people-orientated KM practices, and integrate KM within its business processes.

Utilising a case study methodology the research highlighted a number of factors which need to be considered during the implementation of KM-supporting technology. These include the need for it to; incorporate capabilities, which reflect a number of overall KM critical success factors; be focussed on people-orientated KM; be tailored to fit the specific requirements of the business; be supported at senior level; be allocated appropriate resources and management; achieve staff buy-in; and be integrated sufficiently to become part of the way people work on a daily basis.

Although the research highlighted the effectiveness of the case study organisation's approach, it acknowledged that there is no one-size-fits-all solution. It also highlighted the need for further research examining the long-term use of KM-supporting technology and the application of similar solutions within other firms.

Keywords: community of practice (CoP), knowledge management (KM), microsoft office sharepoint server (MOSS), technology.

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INTRODUCTION

The current economic climate necessitates that construction firms are able to react faster to business opportunities and stay ahead of the competition. The ability of an organisation to innovate and make the most of 'what it knows' may make the difference between its success and failure. Knowledge has long been identified as a valuable organisational asset and source of competitive advantage, with many firms both within the construction industry and external to it striving to manage knowledge effectively. However, managing knowledge has proved to be a difficult process, with many organisations experiencing numerous problems in successfully implementing and sustaining Knowledge Management (KM) initiatives. Further to this, KM literature has highlighted the need for an improved understanding of the components necessary to realise a balanced KM initiative and the factors, which will determine its success. By adopting a case study methodology, this study examines the approach taken within an engineering design consultancy to support its people-focussed KM initiative with technology.

INNOVATION AND KNOWLEDGE MANAGEMENT

The importance and role of innovation in the overall construction process and necessity for firms to become more innovative in reaction to an increasingly competitive construction industry has been well documented (Egbu, 2004; Robinson et al. 2005; Bolwijin and Kumpe, 1990). Several authors have even suggested that innovation has been seen to replace efficiency and quality as the main source of competitive advantage for such firms (Bolwijin and Kumpe, 1990; Egbu, 2004).

Egbu (2004) suggests that the ability to innovate depends largely on the way in which an organisation uses and exploits the resources available to it. Further to this he suggests that it is the requirement for construction firms to become more innovative and to maximise the use of their resources that renders 'knowledge' as a strong organisational asset suggesting that "few would argue that an organisation's capacity to innovate depends to a very considerable extent upon the knowledge and expertise possessed by its staff." Edvinsson (2000) illustrates this fact by asserting that knowledge is fast overtaking capital and labour as the key economic resource in advanced economics, while Johannessen and Olsen (2003) state that an organisation's capacity to create and sustain competitive advantages lies in what it knows, not what it owns. Knowledge as a competitive advantage is a topic, which has been highlighted by many authors, who are in agreement that there is now a general acceptance in competitive business environments and project based industries that knowledge is a core organisational and project resource, providing market leverage and contributing to project success (Egbu, 1999; 2004; Nonaka and Takeuchi, 1995; Pan and Scarbrough, 1998; Tseng, 2008).

Knowledge is defined by Nonaka and Takeuchi (1995) as "a dynamic human process of justifying personal belief toward the 'truth'." However, they continue by describing two distinct types of knowledge as being; tacit and explicit. Explicit knowledge is defined as that, which can be articulated through formal language, including grammatical statements, mathematical expressions, specifications and manuals. This kind of knowledge can be shared by individuals formally and easily and is often referred to as hard knowledge. Tacit knowledge is described as that, which exists as personal knowledge, embedded in an individual's mind and is often defined as soft knowledge. This type of knowledge is influenced by factors such as personal belief and perspectives, making it hard to formalise and difficult to communicate or share with others. Tacit knowledge in particular has been highlighted as being particularly important for construction firms, due to the need for high levels of problem solving and technical ability (Anumba et al. 2005; Robinson et al. 2005). Robinson et al. (2005) emphasise this point by stating that tacit knowledge is key in producing innovative projects, which incorporate design and construction solutions that cannot be met by established answers.

Alternative definitions of KM have been presented by various authors. Davenport and Prusak (1998) state that KM is "the process of capturing, distributing and effectively utilising knowledge." This is similar to the definition proposed by Scarbrough et al. (1999), who describe KM as the process of "creating, acquiring, capturing, sharing and using knowledge to enhance organisational

learning and performance." Robinson et al. (2005) describe KM as a method of "exploiting or transforming knowledge as an asset for organisational use, to facilitate continuous improvement." The existence of the two different types of knowledge and definitions has generated considerable interest within KM literature and within the construction industry as to the best methods of sharing this knowledge, with firms such as Amec, Arup, Balfour Beatty, Bovis Lend Lease, Cyril Sweet, Taylor Woodrow, Turner Townsend and Wates Construction investing in KM (Carrillo, 2004).

KM research has focussed on two distinct KM strategies; codification (IT) and personalisation (people) (Robinson et al. 2005). Codification strategies use IT-tools to capture and leverage explicit knowledge, whereas personalisation strategies focus on non-IT-tools or human interactive systems to leverage tacit knowledge. Carrillo and Chinowsky (2006) explain the link between these two approaches and Nonaka and Takeuchi's (1995) distinction between tacit and explicit knowledge, by suggesting that:

"Explicit knowledge is that which could be documented and therefore physically stored in either paper or electronic format. For the construction industry these include standard operating procedures, best practice guides, etc. Explicit knowledge thus lends itself to an IT-centric strategy. Tacit knowledge is that which is stored in people's heads and is acquired through experience. This is much more difficult to document. For construction this covers the know-how of experienced staff, e.g. team leaders. Tacit knowledge is better shared using communication channels."

Early discussions within KM literature tended to focus on the use of IT-orientated solutions, which in 1998 were the focus of almost 70% of articles (Oltra, 2005). Although the limitations of approaches focussed too narrowly on IT have long been emphasised and the key importance of cultural and people-orientated aspects has been widely recognised (Bresnen et al. 2003; Oltra, 2005), IT is highlighted as being essential to an organisation that wishes to manage its knowledge assets (Egbu and Botterill, 2001; Tseng, 2008). Research projects that have examined balanced approaches to KM (people, process and technology-based KM practices) have concluded that a multifaceted approach focusing on all aspects of KM is vital (Bishop 2008b; Carrillo, 2004b; Pan and Scarbrough, 1998). In this respect, this paper utilises the term 'KM initiative' to denote a balanced KM strategy.

With respect to technology, Tseng (2008) states that the value of IT to KM is in enabling the expansion and universalisation of the scope of knowledge and in increasing the speed of transferability. Tseng (2008) also suggests that advancements in IT and the internet have greatly enhanced the value of knowledge assets. Lin and Huang (2008) highlight the importance of ensuring that the users of such technology perceive it to be useful, and suggest that the effectiveness of a KM technology is dependent on the extent to which a knowledge sharing culture already exists. Further to this, they state that the users need to feel that utilising the technology is beneficial to them on a personal level. In terms of the specific technologies used, several authors identify the need for it to serve different purposes such as authoring, indexing, classifying, storing, contextualising and retrieving information, as well as for collaboration and the application of both tacit and explicit knowledge (Lindvall et al. 2003; Tseng, 2008).

The difficulties associated with understanding and managing organisational knowledge has meant that many organisations experience problems in successfully implementing and sustaining their initiatives (Egbu, 2004; Oltra, 2005; Tseng, 2008). Several have identified specific barriers to the adoption of effective KM initiatives (Egbu, 2004; Oltra, 2005; Carrillo et al. 2000), described as:

- An incoherent knowledge vision / lack of ownership of the knowledge vision;
- No appreciation / lack of appreciation of knowledge as an important asset;
- A lack of an information sharing culture and climate;
- A lack of / or inappropriate methods / tools for measuring and valuing knowledge;
- A lack of / inadequate standardised processes;
- Rigid / inflexible organisational structures;
- Time constraints and pressure on key staff / knowledge 'experts';
- Fear of the use and application of IT tools for KM (Technophobia);

- The ‘knowledge is power syndrome’ and failure to see the ‘law of increasing returns’ associated with knowledge creation, that shared knowledge stays with the giver while enriching the receiver; and
- A lack of a clear purpose and shared language and meaning of knowledge management.

Bishop et al. (2008b) support the idea of a balanced approach to KM but identify the necessity to focus on people-orientated KM solutions and provide support for these with the best suited technology and processes. However, Tseng (2008) states that few studies have explored the role and effect of IT on KM initiatives. Within the literature, although the barriers to the implementation of effective KM initiatives are understood, there is not a comparable degree of clarity on the success factors for balanced KM. The aim of this study was therefore to examine the successful balanced approach taken by a multi disciplinary engineering design consultancy, in implementing KM-supporting technology to a) sustain its people-orientated KM practices, and b) integrate KM within its business processes.

METHODOLOGY

In order to establish a best practice approach for the use of technology to support a balanced KM initiative, it was necessary to examine the successful application of KM-supporting technology within a construction organisation. This demanded the use of a case study methodology, which can be defined as being an empirical inquiry that investigates a contemporary phenomenon within its real life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used (Yin, 1984). As within this study, the most common use of the term associates the case study with a location, such as an organisation, and focuses on the intensive examination of the setting (Bryman, 2004).

In relation to data collection, ethnographic research methods were utilised. Ethnography, a term which is also used interchangeably with ‘participant observation’ and ‘fieldwork’ (Delamont, 2004), refers to the extended involvement of the researcher in the social life of those he or she studies, in order to observe people, talk with them and form an understanding of what they are doing, thinking and saying (Bryman, 2004; Delamont, 2004). This entailed observation of, and involvement in the daily operation of the business to facilitate the identification of KM best practice.

CASE STUDY ORGANISATION

Ramboll Whitbybird (RWB) is a multidisciplinary engineering design consultancy specialising in a wide range of engineering services. As well as structural engineering (its core business) it also offers a number of other disciplines including; building services, fire, façade, and geotechnical engineering, bridge design, infrastructure and public health, environmental assessment, and sustainable and renewable projects. Over the past eight years, it has invested in extensive research to maximise the potential of the knowledge held by its staff in order to encourage innovative design solutions, recreate project successes and avoid the repetition of mistakes (Bishop et al, 2007; Bishop et al, 2008a; Bishop et al. 2008b; Matsumoto, 2006).

During the last year RWB has invested in a technology platform to enable it to better manage its data, information and knowledge across the business, as the company grows and becomes more geographically dispersed. Rapid advancements in KM-supporting technology and their capabilities made the choice of the best-suited tool for RWB a critical consideration. Following the review of several KM-supporting technology platforms, Microsoft Office SharePoint Server (MOSS) was identified as being well-suited to RWB’s KM needs.

As a result of the KM research carried out to date by RWB, its people-orientated KM practices were prioritised for development and improvement. In particular, the firm’s Task Groups (TGs), which are its equivalent of Communities of Practice (CoPs), have become a core element of its KM framework, and over the last year it has achieved a number of successes in improving their

effectiveness (Bishop et al. 2008b). However, the research had highlighted the need for a balanced approach for KM, which was focussed on people, integrated within the business and supported with technology. In this case, MOSS, which also exists as RWB's intranet platform, supports KM within RWB on a number of levels, and for numerous business processes and activities. The focus of this study however, was to examine the approach taken towards the initial implementation of MOSS to support RWB's overall KM strategy, and the ways in which it was utilised to support the organisation's TGs.

FINDINGS

Although one of the key features of MOSS is as a document management tool, RWB has initiated a carefully thought out implementation, development and management strategy for MOSS to maximise its potential as a more balanced KM tool. Indeed, a document or information management tool is not capable of managing tacit knowledge (Quintas, 2005), and for this reason it was important to utilise the collaborative capabilities of MOSS to facilitate both tacit and explicit KM.

IMPLEMENTING MOSS AS A KM-SUPPORTING TECHNOLOGY

RWB is acutely aware of the necessity for a balanced approach to KM, and has adopted an overall KM strategy and action plan, which accounts for the KM critical success factors identified by Bishop et al. (2007). To ensure that MOSS supported RWB's KM strategy, its implementation was based on these critical success factors. This ensured that the introduction of the technology was undertaken in a structured manner, which incorporated change management principles while also accounting for the requirements necessary to achieve an effective and balanced KM initiative. The following section outlines the actions taken in order to address each of the critical success factors.

Understand and define KM across the organisation

It was essential that MOSS was implemented and communicated across the business as a KM-supporting technology. Further to this it was important from the outset that MOSS was developed with knowledge capture, sharing and dissemination as its core attributes. Although the system comes as an 'off-the-shelf' solution, it was selected partly due to the fact that MOSS is very adaptable and could be 'tailored' to suit RWB's KM requirements, and as such the company invested substantially in further development of the technology. In order to ensure that the development of the system was in line with RWB's aspirations, the compilation of an initial brief and specification for MOSS was an important stage. The brief outlined the need for MOSS to "retain and enhance RWBs ability to create, capture, process, retrieve and disseminate data, information and knowledge….and enhance RWB's reputation of expertise in using effective Knowledge Management initiatives and systems." Further to this, the brief acknowledged that MOSS had specific requirements, which needed to be met by the business in order to facilitate effective KM, including:

- Full commitment from management, assignment of sufficient funds at project start-up, and extensive communication to ensure buy-in from staff;
- Assignment of staff with sufficient resources to plan, design and implement the new system;
- Training, which takes into account the system functionality as well as the business change;
- An innovative view and application of the technology, which is aligned with business objectives;
- Consider the role of CoPs and level of managerial involvement in CoPs; and
- Utilise appropriate measurement criteria.

Establish a fit with the needs of individuals and the business

The process of 'tailoring' MOSS to suit the requirements of the people using it was vital, not only in ensuring efficiency but also to ensure that people were comfortable using it, found it useful, and therefore 'bought-in' to the technology. To achieve this, a strategic-level MOSS 'steering group' was set up consisting of 10 RWB directors. This group was responsible for the overall management

of the system and also for determining the best ways in which it could support the advancement of the business. At an operational level, three 'user groups' were established for different areas of the business; Task Groups, disciplines and projects. User group meetings were held on a monthly basis with the MOSS development team in attendance. This meant that with each iteration of the framework for MOSS, the end users of the system could provide feedback on its usefulness for them. Early involvement of the end users in the design of MOSS was also important in facilitating ownership.

Integrate within the organisation and daily lives of staff

The introduction of MOSS represented a big change within the business and to the way people worked on a day-to-day basis. As a result it was important to implement the system in a 'step-change' manner, introducing a number of small changes over a longer period of time. The different areas of the MOSS system were only opened up across the company for everyone to use after development of each area was complete, the user group feedback was positive, and key individuals had been trained. The design of the system, based on the brief, was such that it was intended to become part of the way people work on a daily basis in order to reduce unproductive time and to make their work lives easier. To support this and further integrate MOSS within the core business processes, it was also tied in with RWB's Quality Assurance (QA) procedures.

Implement KM champions and a supporting team, and establish top-level support

Senior level-involvement was essential not only in ensuring that the implementation of MOSS had the right resources and management, but also in demonstrating the importance of MOSS to the rest of the business. Although this was initially achieved by setting up the steering group, it was strengthened by establishing one of the steering group members as a 'MOSS champion', responsible for spreading the word as to the benefits and importance of MOSS across the business.

Demonstrate and communicate benefits and successes

The steering group members took a very visible approach to communicating the benefits and successes of MOSS by giving a number of presentations across the company. The development team also played an important role by visiting all regional offices to do further introductory presentations. Training was an important aspect in demonstrating the capabilities and benefits of the technology. Initial training sessions were held with groups of employees including directors, team leaders, personal assistants, and engineers. Follow-up one-to-one training sessions were then held for those who requested them, and were also intended for further tailoring of the system to suit the needs of different groups of employees.

Determine suitability of financial and non-financial rewards

Financial rewards have never been part of RWB's culture as they could potentially inhibit the open and collaborative nature of the firm, and were therefore rejected for MOSS. However, senior managers actively recognise successes within the business by publicising them through email and other internal communication tools. MOSS has been highlighted within several internal RWB newsletters and has been consistently highlighted by senior managers at management meetings and internal presentations. Recognition of the importance of MOSS to the business has also been evident through the ongoing commitment of funding and resources for MOSS-based initiatives.

Achieve a balance between people and IT

The brief for MOSS outlined the importance for the technology to be a supporter of people-based KM activities. People-based KM is at the core of RWB's KM strategy, with CoPs in particular proving to be an effective people-orientated KM practice. In that respect, MOSS has been communicated across RWB as a supporter of KM, rather than as a KM solution in its own right. Since the introduction of MOSS, people have continued to be the focus of RWB's KM efforts; however, RWB has acknowledged that as it continues to expand, the role of MOSS will become more important.

SETTING UP COLLABORATIVE WORK SPACES FOR TASK GROUPS

Task Groups (TGs) have existed within RWB for many years and have become a central aspect of the organisation's culture. As a result of recent development and improvement initiatives for TGs,

they now function as a core KM practice for RWB. While TGs, particularly over the last year have proved to be effective, as the company has expanded and its geographic spread increased the demand for technology to support the traditionally face-to-face based approach to TGs has grown. RWB's KM strategy acknowledges the need for people-based KM practices to be integrated within business processes and supported with the best-suited technology. As a result, MOSS was identified as being an important tool in supporting the ongoing operation of TGs.

To support TGs, MOSS was utilised to set up collaborative intranet-based sites for each group, which were accessible to anyone across the company (Figure 1). The benefit of these sites to the TGs and to the organisation as a whole was that they would provide capabilities for the capture, storage and dissemination of both tacit and explicit knowledge. In relation to tacit KM (and tacit to explicit knowledge conversion), each site included a discussion forum to enable the TG members, and anyone else within the firm with relevant knowledge or interest, to discuss issues, ideas or experiences related to TG topics or projects. It was intended that the discussion forums would replace the necessity for some email traffic to encourage knowledge capture, which may otherwise have been lost or not shared effectively through an email discussion. 'Wiki'-type pages were also created for each site (Figure 2), providing an area for TG members to document experiences, guidance and recommendations on numerous areas of expertise relevant to their TG colleagues. TG members could also highlight important issues or topics of interest through an 'announcements' function, which is aggregated through to RWB's intranet home page, and can also be linked to email. The need for people to continue to be at the core of knowledge sharing within RWB, meant that wherever possible the MOSS pages were designed to facilitate face-to-face collaboration by providing the names of experts and links to contact details.

With respect to the capture of explicit knowledge, the TG sites utilised two functions; document and image libraries (Figure 3). These enabled TG members to capture any relevant documentation and images, particularly in the case of best practice guidance documents. As well as storing all related documentation in one location, the added advantage of capturing documents within MOSS is that the process encourages validity and collaboration. Each document can be 'checked out' by one of the TG members, while he or she edits it. Anyone else who opens the document will see a 'read only' version indicating that someone is working on it, until it has been checked back in. This meant that there was only ever one 'current' version, avoiding the problem of people working on and saving their own separate copies. Images and documents can be linked into discussions, announcements and wiki entries on the TG sites to further enhance knowledge sharing and collaboration.

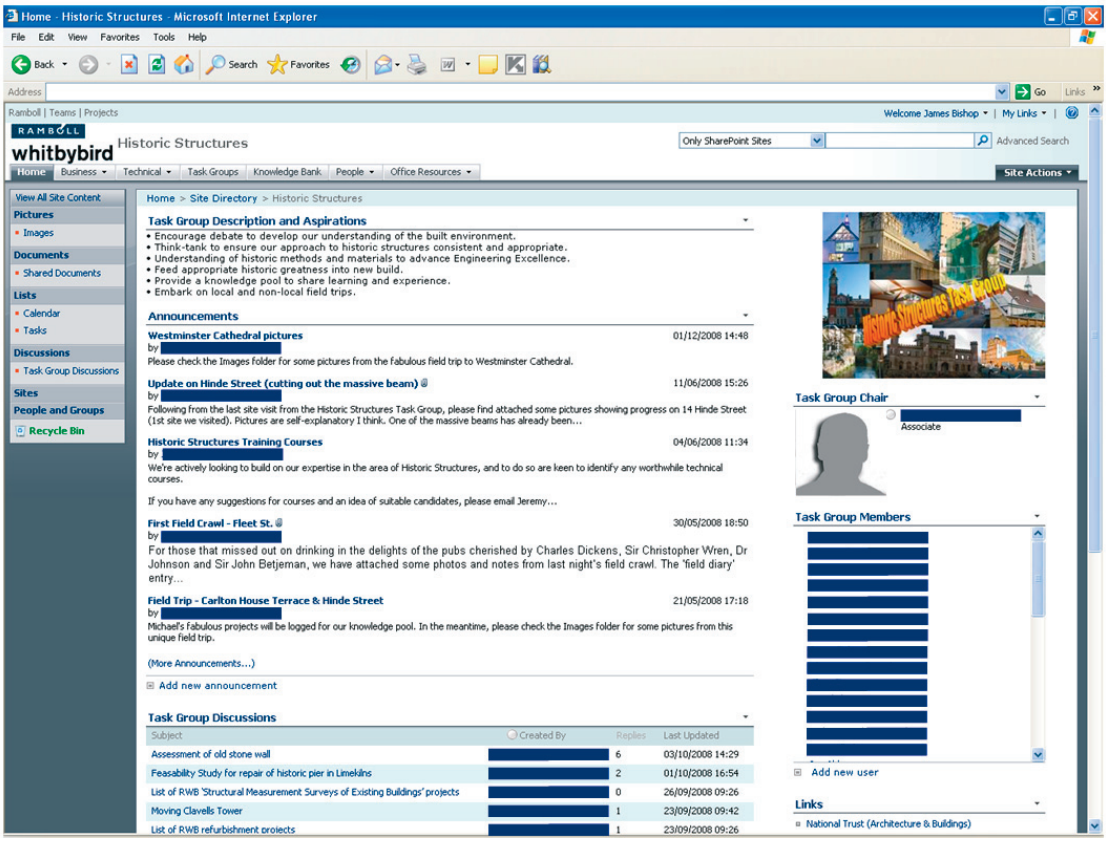

Figure 1: Example of Task Group MOSS site

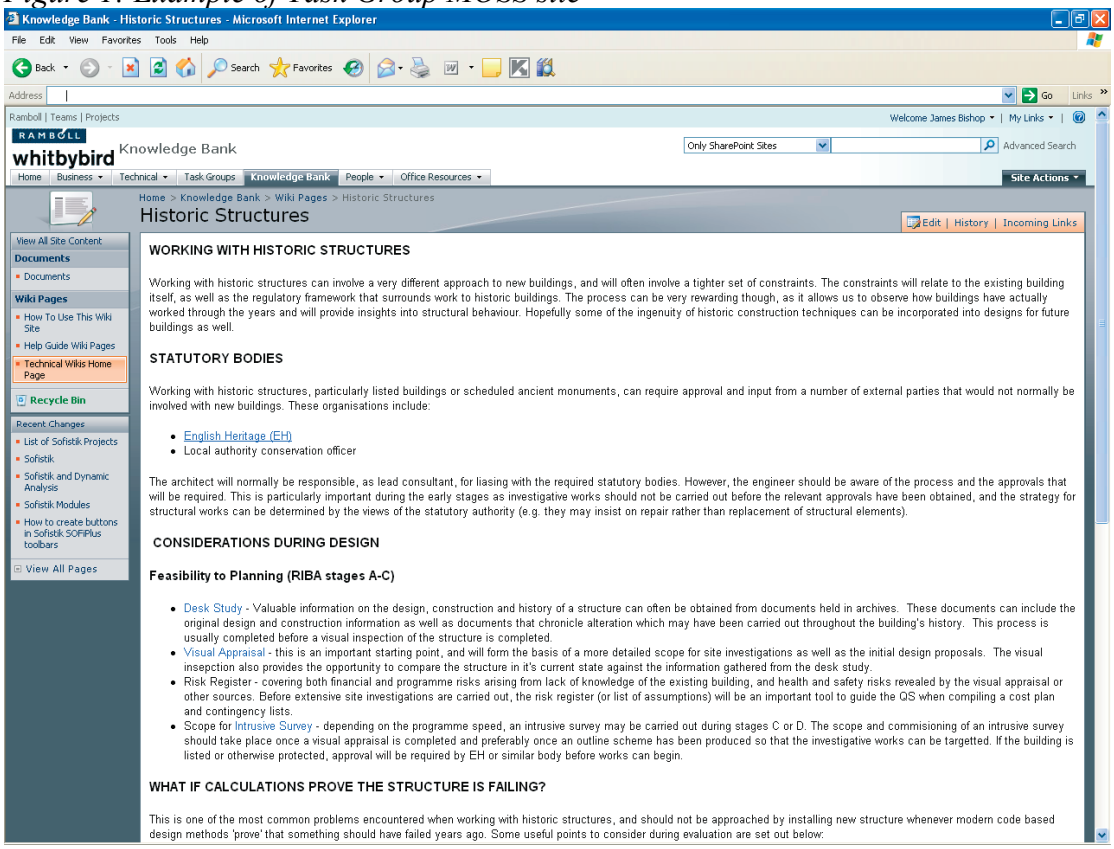

Figure 2: Example of Task Group 'Wiki' page

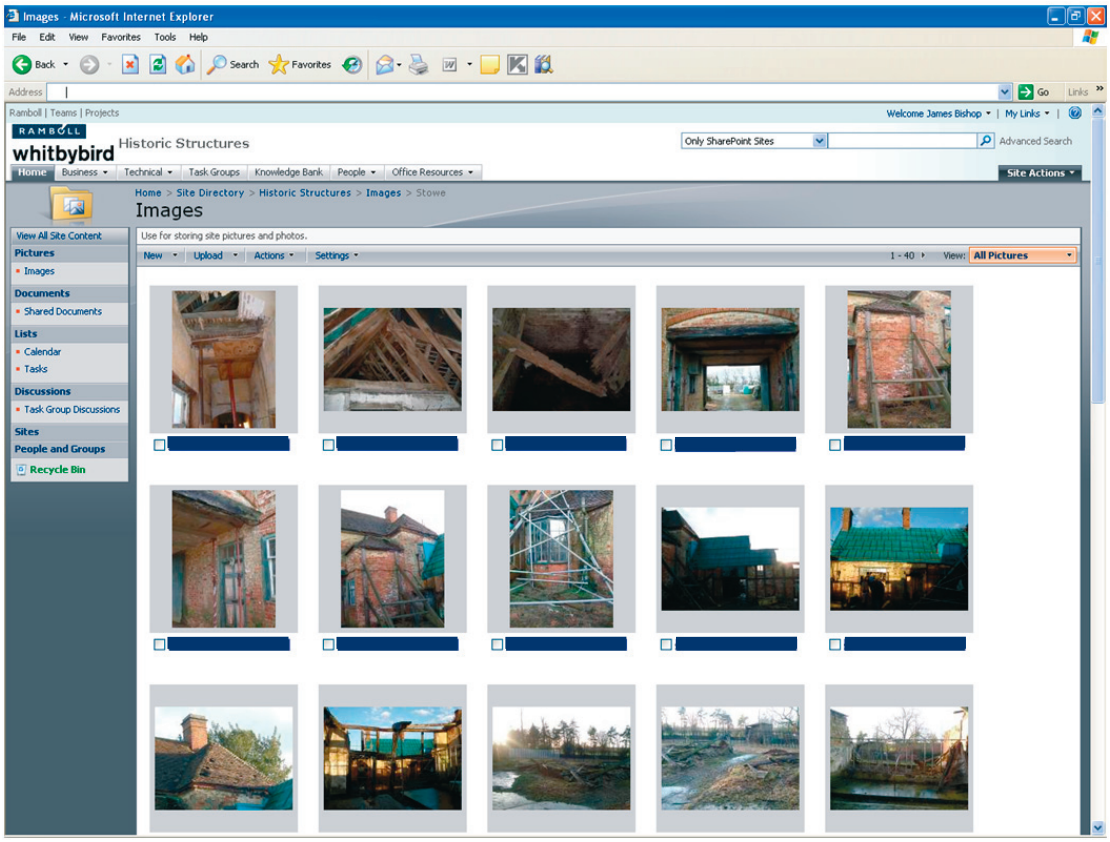

Figure 3: Example of Task Group Image Library

As a core aspect of RWB's KM strategy, TGs were positioned as a central area on the MOSS system (the 'TG home page'), providing links to each individual TG site. This emphasised the importance of TGs to the business, while also facilitating easy access to the TG sites for any member of RWB staff (within 2 'clicks'). The formation of a 'TG site user group' was essential in designing the template for the TG sites. By liaising with members of the user group, which consisted of TG members and chairs, the MOSS development team ensured that the sites would be best-suited to the needs of the TGs. Following the development of the template, individual MOSS sites were created for every TG. In line with the introduction of the sites, a rigorous MOSS training programme for every TG chair and at least one other TG member was implemented. Ownership of the TG sites was then handed over to the respective TGs, enabling the members to keep the data, information and knowledge captured within their sites updated. Initially, the TGs were required to upload a minimum amount of information, including the names of the chair and members and its aims and objectives, before the sites were made visible across the company.

Following the implementation of the TG MOSS sites, the TGs experienced several main benefits from their use. The key advantage has been improved accessibility to data, information and knowledge in specific areas of expertise, not just for TG members but for RWB employees across the world. Following the introduction of MOSS within RWB, several new TGs have formed. By setting up MOSS sites from the outset the TGs found the process of establishing their TG, communicating aims and objectives, and raising awareness of their new group far easier. Further to this, it had become more straightforward to become associated as a member of a TG. For TG meetings, administration time was reduced by storing meeting agendas and minutes on their sites and using them as 'live' documents, updating them during their TG meetings. For senior managers, measuring TG performance also became a simpler process as TG tasks and activities could be monitored through MOSS.

CONCLUSIONS

Although the technology used in this case has proved to be an effective tool, particularly for CoPs, it is important that technology is seen as a supporter of KM. People and people-orientated KM solutions such as CoPs should be the core focus of any KM initiative. However, where large firms become geographically dispersed, technology is important in sustaining the effectiveness of people-orientated KM.

The development of any KM-supporting technology needs careful consideration as there is no one-size fits all solution. Prior to the implementation of KM-supporting technology, the organisation needs to establish a KM strategy and action plan to ensure a clear understanding of KM across the business. KM-supporting technologies will require careful selection and a level of 'tailoring' to ensure that they fit with the KM requirements of the business, its individuals and the way in which it operates on a day-to-day basis. Early involvement of end-users in the design and development of the technology is essential in ensuring it is best-suited for their needs and in providing ownership. Empowering employees to take ownership of KM-supporting technology is an important step, not only in gaining sustained buy-in from staff, but also in ensuring the validity of the data, information and knowledge captured. This de-centralised approach encourages experts within the organisation to collaborate with like-minded colleagues and drive knowledge sharing within their specialist areas.

It is important for the organisation to provide the technology with the right resources. This includes providing the right approach to technical support, training and further development of the technology following its initial implementation. Support from senior management also demonstrates the value of KM and the technology itself to the business. The culture of the organisation is likely to have an effect on the successfulness of KM-supporting technology. Within RWB, the organisation's open, collaborative, team-orientated culture and the existence of CoPs, meant that its staff were already proactively sharing knowledge and have 'bought into' the technology. In this case success was based on the ability of the technology to suit the needs of the end-user and the effectiveness of change management approaches applied during its implementation. The impact of change was lessened by the introduction of a system that was Microsoft-based and therefore had a familiar feel to it. The fact that the KM-supporting technology solution had been partly designed by the end-users was also a key factor.

The use of MOSS to support people-orientated KM has proved to be an effective solution for the case study organisation. As well as empowering CoPs to take greater control of their actions, the use of MOSS has created a greater awareness of CoP practices across the business and encouraged sustained collaboration and knowledge exchange. Further research examining the long-term use of (people-based) KM-supporting technology would be useful in determining patterns of sustained usage and the continued effectiveness of such tools. An examination of the use of MOSS to support KM within other firms would also be beneficial in providing a comparison with the findings established within this study.

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