

UTILISING INTRANET TECHNOLOGIES IN CONSTRUCTION SECTOR SMES: BUILDING UP KNOWLEDGE BASES FOR EXTREME WEATHER EVENT RISK MANAGEMENT

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Intranet technologies accessible through a web based platform are used to share and build knowledge bases in many industries. Previous research suggests that intranets are capable of providing a useful means to share, collaborate and transact information within an organization. To compete and survive successfully, business organisations are required to effectively manage various risks affecting their businesses. In the construction industry too this is increasingly becoming an important element in business planning. The ability of businesses, especially of SMEs which represent a significant portion in most economies, to manage various risks is often hindered by fragmented knowledge across a large number of businesses. As a solution, this paper argues that Intranet technologies can be used as an effective means of building and sharing knowledge and building up effective knowledge bases for risk management in SMEs, by specifically considering the risks of extreme weather events. The paper discusses and evaluates relevant literature in this regard and identifies the potential for further research to explore this concept.

KEYWORDS: EWEs, Intranets, knowledge management, SMEs.

INTRODUCTION

The world in recent years has seen a number of Extreme Weather Events (EWEs) causing large losses of life as well as significant economic losses (Easterling et al., 2000a). As a result, cumulative economic and social costs of extreme weather related events has been increasing around the globe (McBean, 2004, Tompkins, 2002). Apart from individual households, business sector also suffers economic losses due to the effects of weather extremes. Small and Medium-sized Enterprises (SMEs), which represent the majority of business establishments in any economy, suffer at a higher magnitude than their larger counterparts. This is due to their increased vulnerability to these effects (Bannock, 2005). SMEs make up more than 90% of firms in the construction industry too. Therefore improving effectiveness in SME operations by an approach that is sympathetic to their needs of managing risks is likely to benefit the construction industry to a significant extent.

It is recognised that one of the inherent weaknesses of SMEs is that they face resource limitations. Whilst this hinders the adoption of EWE risk management practices, it is also well known that the ability to manage risks due to EWEs is inconsistent and varied across the SME community at large. For instance, in terms of buildings and contents insurance, this

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inconsistency is displayed to a greater extent with a significant number of SMEs being under insured, thereby exposing their assets and becoming more vulnerable to weather extremes (AXA Insurance UK, 2008). The inconsistent SME ability to manage EWE risks was also displayed during the 2008 flooding of the Morpeth area in Northumberland, specifically with respect to flood defences. Therefore it is proposed in this paper that collaboration among SMEs within their respective communities and networks is the best way to achieve EWE resilience. Given the fact that many SMEs within their ordinary course of business tend to operate as close collaborating networks and supply chains rather than individuals, it is argued that an Intranet system will facilitate and develop their collaborative behaviour and reduce the fragmentation of knowledge. Employing an IT system will allow to bring together the valuable knowledge, with regard to EWE risk management, which is otherwise widely dispersed. At the same time as the system will be commonly accessible to the network, individual members will benefit from a better knowledge base requiring a lesser resource commitment.

The paper is organised as follows. First, it presents the background and the research problem. It then argues how Intranets are formed to facilitate more intensive collaboration. The paper, then provides the case for a collaborative Intranet approach in the context of SMEs and how EWE risk management knowledge sharing can be facilitated via an IT based system. The paper concludes by establishing the case for further research in this area.

BACKGROUND AND RESEARCH PROBLEM

EWEs such as floods, heat waves and storms are expected to increase in number and severity in future, due to the impacts of climate change (Munich Re, 2007, Stern, 2007, Environment Agency, 2005). These EWEs are capable of creating severe impacts on the society and the environment (Easterling et al., 2000b, Nicholls and Alexander, 2007). The costs of damage caused by EWEs have increased gradually over the years and are expected to further increase in the future. Based on a variety of sources Dlugolecki (2008) estimates the global annual cost of weather damage on average is to be in the range of \$200–330 billion. In the United States alone, costs of disasters associated with weather is estimated to be about \$23 billion per year on average (Preston, 2005). In UK, insurers have paid over £3 billion to recover from 2007 summer floods alone, whilst the full economic and social cost is likely to be many times higher (Association of British Insurers, 2007).

A major portion of economic losses associated with EWEs are created upon the business sector. However, it is difficult to present statistical evidence for this as most studies that have attempted to assess the economic consequences of weather disasters have tended to concentrate primarily on aggregate-level effects, such as community wide and regional economic losses, rather than on firm level impacts (Webb et al., 2000). Out of the consequences exerted upon the business sector, a significant portion is suffered by SMEs, which represent the majority of businesses in any economy. In fact they are said to be the most vulnerable portion of an economy to the impacts of extreme weather (Crichton, 2006). According to Bannock (2005), their vulnerability arises virtually by definition from the small scale of their human and financial resources. On the other hand, as a majority of SMEs are local in their operations and rooted in local communities (Bannock, 2005), their owners are often hit twice by EWEs; as local citizens and business owners (Runyan, 2006), making it more difficult for them to survive. Whilst the cost of EWE on an individual SME may not cause a significant impact on the local economy in terms of the earnings it generates or the number of people it employs, the collective losses on a number of small businesses may

devastate a local economy (Yoshida and Deyle, 2005). These factors warrant the uptake of necessary risk management measures by SMEs, to effectively manage EWE risk. Yet, previous research suggests that many small businesses are ill prepared for recovery after a disaster (Yoshida and Deyle, 2005). Further, the EWE risk management strategies for SMEs have become important issues requiring widespread attention. Despite the presence of these issues, disaster management literature has not dealt in depth with small business response to disasters (Runyan, 2006, Alesch et al., 2001, Tierney, 1994), not to mention EWEs. There is thus an obvious case for focusing on SMEs with regard to EWE risk and its management.

Analysis of background information with regard to EWE risk management in SMEs presents an interesting research issue that could stimulate a lot of interest within the construction industry. It raises the challenge of identifying ways and means of achieving effective EWE risk management in construction sector SMEs. Given the fact that over 90% of the total number of construction companies in UK fall under the category of SMEs (Sexton and Barrett, 2003), effective risk management in SME sector is likely to improve the effectiveness of the construction sector as a whole. Improving the efficiency of SMEs is essential to establishing an industry which delivers best value and satisfaction to its customers. Yet, construction management literature has not dealt with EWE risk management in depth, especially with regard to SMEs.

The aim of this paper is to propose a collaborative approach for EWE risk management in SMEs, utilising Intranets within SME networks and supply chains. Such collaborative EWE risk management will bring together the fragmented knowledge, which could be leveraged for effective and efficient EWE risk management. In this paper we propose more in depth research in to EWE risk management through a collaborative Intranet system that brings SMEs and their supply chain partners together. Providing long term solutions for SMEs to manage the risk, in collaboration with their principal supply chain partners or relevant Business Link organisations, is an area that has not yet received adequate attention both at a micro level as well as at a policy making macro level.

INTRANET TECHNOLOGIES

Intranet technologies have been developed in many industries to share and build knowledge bases that can be accessed via a web based platform. This technology has the potential to be exploited within SME networks so that the SMEs can build up EWE risk management capability within their companies.

An intranet is an inter-connected network that uses web technologies for the sharing of information internally within an organisation. By utilising Collaborative Intranet Technologies (CITs), SMEs could share information, collaborate and transact across various technical platforms and information systems, and across functional, structural and geographical boundaries within the organization, in a user-friendly manner (Bernard, 1996; Damsgaard, and Scheepers, 2000). Since Intranets use the web as the common platform for information and knowledge sharing, it provides a simple solution to transact and exchange across SME networks and supply chains.

Intranets may be implemented centrally in organisations as corporate intranets. They can also be implemented as units (such as divisions, departments or functional groups) depending on their size (Ingirige and Sexton, 2007). Functionalities of Intranets vary between the passive publicising of up to date company information among its employees to dynamic exploitation

of some of its capabilities to integrate with social networks. Through its role of locating, transferring and more efficiently using information and expertise (Offsey, 1997), Intranets are positioned as effective and efficient tools in organisational knowledge sharing and learning.

Intranets are utilised to download and upload information from / to the central databases enabling organisation wide sharing of information and knowledge (Guenther and Braun, 2001). Curry and Stancich (2000) for example describe further functions of Intranets as encouraging information sharing, information publishing and facilitating document management. Wang and Xie (2002) indicate that Intranets have the capability to perform many functions in all directions of an organisation hence capturing the supply chains. This shows how the capability and performance of Intranets could leverage better performance of SME networks, enhance links between local chambers of commerce and business links that advice SME participation and improve collaboration across SMEs and other supply chain partners for EWE risk management in the construction industry.

CASE FOR SME COLLABORATION VIA INTRANETS

Studies have shown that higher levels of cooperation and trust exist between SMEs and their principal supply chain / network partners. For instance, Gray (2006) reveals that SMEs overwhelmingly prefer their trading partners (customers, suppliers, partners in joint projects and so on) for more business-related advice and information. On the other hand, the same author further reports that most SMEs, even those that are active in several networks, still fall short of requisite knowledge or resources in complying with various commercial regulations on an individual basis. This is indicative of the genuine cause for implementing the practice of collaboration within SME networks, as this enables the transfer of advice and information among network members to share risks of business failure. Collaborations also minimise resource requirements due to the effect of synergy. Many SME networks are driven by large scale organisations that have power and compliance to direct the SMEs in the network. For instance, in the construction industry, architectural and engineering consultancy organisations are capable of applying (and to a certain extent enforce) good practice among the members of the construction supply chain. The core Intranet specification can be designed to suit these contexts, where trust and long lasting relationships have already been established.

Earlier it was pointed out that EWE risks also have a major influence on SME business failure. Resource constraints of SMEs might not allow autonomous implementation of these tasks. Under the collaborative approach, resources required for these tasks will be shared between the SMEs in the particular network, so that they can benefit from a common database or a common collaborative approach. This will require the development of a knowledge base common to the network, which will allow effective knowledge sharing for SMEs. Knowledge sharing is essential for the functioning of business networks as it influences the co-operation and outcomes that firms are able to achieve (Valkokari and Helander, 2007). Thus, utilisation of such SME networks for risk management will offer other advantages such as improved communication and co-operation. Another factor that improves collaboration via Intranets is the issue of internet security. For instance, according to Hall (2001), well secured Intranets make users aware of its existence and encourage them to use them more frequently

From a SME perspective there may be barriers that will constrain the spirit of communication and co-operation. For instance, the move to more collaborative inter-organisational relations will cause difficulties unless the appropriate competences already exist, or are developed

within a culture that embraces change (Macpherson and Wilson, 2003). Thus, it is important to examine to what extent IT systems are used in SME networks, enabling them to participate in collaborative IT networks. Results of an investigation into the adoption and use of ICT in SMEs (Rae, 2006) in the West London and Thames Valley area suggests that some SMEs are already using intranets in their businesses effectively. Such practices are not common within SMEs in the construction industry. But Hassan and McCaffer (2002) studied the use of intranets in large scale construction firms and stated that their usage is becoming more frequent and that within a 10 year period it doubled. Thus, it seems that the potential of using intranets for risk management purposes exists in construction, but less likely within SMEs and networks. Therefore, it is important that one of the key tasks at policy maker level will be to engage SME network leaders / principal supply chain partners of SMEs to use Intranets, who will in turn defuse this technology within SMEs that they regularly interact with.

In addition to the competencies, the attitudes may pose an effective barrier to the efficient operation of such collaborative networks (briscoe et al., 2001). For instance, it is important to establish a higher level of trust within the SME networks if such a collaborative approach for sharing information and knowledge to be successfully implemented. This can be particularly challenging in an industry like construction, which is traditionally seen as adversarial. Davey et al (2001) have found that interacting with other groups within a non-adversarial environment and benefiting from the process allows construction SME to collaborate with each other more successfully. They further reveal that the trust and confidence generated from working together successfully also leads construction SMEs to share good practice with others from the industry, including local competitors. It thus can be seen that even though some attitudes such as trust may pose barriers to the efficient operation of collaborative networks, such barriers are also possible to be eliminated from SME networks.

THE EFFECTS OF EWE ON SMES

EWEs are capable of creating significant negative impacts on SMEs. The main risks to any business posed by EWEs are increased costs and loss of revenue (Ingirige et al., 2008, Burnham, 2006, Heliview Research, 2008). Norrington and Underwood (2008) reveal that damage to property/ stock and reduced customer visits / sales as the mostly experienced negative EWE impacts by SMEs operating in South East region of UK in the past two years. According to AXA insurance (2008) the risks of blackouts and damage to property and inventory from EWEs are increasing around the globe. Damage to business premises or contents can affect the ability of a business to survive, due to lost sales or lost production hours, and increased costs such as alternative premises, overtime etc (Association of British Insurers, 2007). Business interruptions caused by EWEs may create severe problems for SMEs since many small businesses fund their operations from weekly cash flow (Runyan, 2006).

Sussman and Freed (2008) mention that businesses face the possibility of interruption due to delays in services like electricity, water, utilities, and transport infrastructure due to extreme weather. Businesses may have to suffer due to such supply chain disruptions arising out of EWEs prevailing elsewhere, even if the business concerned is not directly affected. Businesses in some sectors like tourism, apparel and food and beverages may experience decreased demand for certain goods and services overtime due to EWEs driven by climate change such as extreme temperatures, extreme rainfall, etc. EWEs may create implications for investment, insurance and stakeholder reputation giving rise to difficulty in securing finance and obtaining insurance cover at reasonable cost (Metcalf and Jenkinson, 2005), and

higher insurance premiums (Dlugolecki, 2004). SMEs may also experience other forms of crises such as loss of market share, loss of key personnel, loss of production efficiency, withdrawal of supplies, withdrawal of licences, and loss of quality/standard accreditation (Aba-Bulgu and Islam, 2007). Alone or combined with some other, these effects may critically affect the survival of a small business. In fact, Wenk (2004) reveals that 43% of businesses experiencing a disaster never reopen, and that 29% of the remaining close within two years, indicating the severity of the consequences.

Interestingly, although the effects of EWEs are negative in many obvious ways, they sometimes seem to present businesses with some opportunities as well. Such opportunities, for instance, may arise due to changing markets, customer needs and investor expectations (Firth and Colley, 2006). The collaborative Intranet approach is leveraged to investigate the fragmented knowledge in this area. For an example, high temperatures as in European heatwave in 2003 may create more demand for warm-weather food and drink products. The construction industry will also benefit from extreme weather, due to the increased need for reconstruction and more robust structures (Dlugolecki, 2004). It is agreed that disasters allow community improvements to be made rapidly, rather than gradually (Webb et al., 2000). Thus post disaster reconstruction works may create windows of economic opportunities for SMEs. In addition to these, businesses may well be able to gain competitive advantage and exploit market opportunities if they have a good risk management system in place. Burnham (2006) mention that businesses who survive a EWE may successfully experience increased customer loyalty, new customers, cost savings and additional sources of revenue. In fact, businesses can turn many of the negative consequences mentioned above in to positive ones, if they are well prepared. Hence the need for having appropriate risk management measures in place arises, not only because of the significant threats associated with EWEs, but also because of the opportunities available.

THE MOTIVATION FOR 'EWE RISK MANAGEMENT' KNOWLEDGE SHARING

SMEs usually do not consider risk management activities as a priority area within their businesses due to the perceived misalignment between the opportunity costs associated with risk management measures and potential future probability of their businesses. Further, according to Jones and Ingirige (2008) they are more likely to adopt ad-hoc responses to a certain stimuli rather than responding to the wider debate about the climate conditions and are likely to take reactive measures rather than proactive ones. A study conducted by UKCIP on SMEs suffered by 2007 flooding reveals that they have adopted various ad-hoc measures to cope up with the effects of flooding. Sharing resources with neighbours, using sand bags as a flood barrier, and relocation are some of the steps undertaken during the time of flooding, whereas obtaining insurance cover, premises improvements and internal stock relocation are some of the measures taken after experiencing the floods. However, research shows that SMEs are reluctant to utilise risk management measures even after experiencing negative impacts. A recent study by Heliview Research (2008) reveals that only two out of five companies that have experienced extreme weather or natural disaster during the last year have taken steps to protect their business from this type of risks. Thus, there seem to be many barriers which prevent the uptake of risk management measures by SMEs.

As against the many barriers preventing SMEs from uptake of measures improving EWE resilience, it will be interesting to discover what factors act as drivers for such uptake.

Perquisites for insurance seem to act as a strong driver for risk management practices in SMEs. As an example, a study carried out by UKCIP has identified that businesses previously affected by flooding are now storing their stocks two feet above the floor level, to satisfy the insurance requirements. Further, higher cost of insurance premiums and even inability to obtain insurance cover if adequate risk management measures are not in place will promote such uptake. Regulatory compliance and market forces such as customer perceptions and expectations will also act as drivers especially due to the fact that SMEs normally serve a smaller market share. If customers start to place a strong value over risk management issues, SMEs might be compelled to apply them. Especially larger businesses who have SMEs in their supply chains are capable of initiating such practices, given the fact that non-resilience of SMEs being capable of disrupting the successful operation of the larger organisation as well.

Relevant knowledge to assess and manage EWE risks is fragmented across different SMEs. Absence of a complete knowledge base limits the ability of SMEs to respond to EWEs in an optimal way. Collaboration seems to provide a solution to this and many of the barriers that SMEs face with regard to EWE risk management. Collaboration will make it possible to achieve risk management with a lesser amount of resources, since resources will be shared. Webb et al (2000) reveal that activities that are less complicated and less expensive and measures that provide protection against a range of different types of emergencies are preferred by businesses over technically difficult and more expensive and time consuming efforts. Collaboration is a possible means of making even complex and costly measures into simple and inexpensive ones. Business collaboration is a cooperation between multiple enterprises working together to achieve certain business goals (Orriens and Yang, 2005). Rosenfeld (1996) identifies collaboration as an emerging approach to industrial competitiveness among SMEs. Potential to enter in to collaborations has been rapidly improved due to the advancements in information technology in the recent past. Nowadays, IT systems are widely used in achieving organisational collaboration in business networks. Intranet technologies can be identified as a widely used IT system in business networks. They are used in many industries to share and build knowledge bases that can be accessed and shared through a web based platform.

CONCLUSION

SMEs are increasingly affected by EWEs leading to both significant negative and positive organisational consequences. This necessitates the uptake of necessary risk management measures by SMEs targeted not only at minimising the negative impacts, but also at capturing the positive ones. Yet, the adoption of risk management practices by SMEs in order to cope up with these issues seems to be in its infancy still. Scant literature available addressing these issues portrays the lack of academic attention and the need for more focused studies. As many construction sector SMEs are involved in various networks and supply chains, the paper identifies the possibility of utilising these existing networks to effectively implement the EWE risk management practices. Collaboration in SME networks with a view to performing EWE risk management seems to offer interesting research prospects. Developments in IT systems and their usage in SMEs seem to facilitate the process of collaboration in SME networks. The paper identifies the potential of using a mature technology like intranets to achieve EWE risk management practices in SME networks. Successful Intranets need an effective Intranet specification and an efficient user interface, compliant with SME user needs.

The proposed solution gives rise to many research issues which have not been addressed previously. The applicability of the proposed solution has to be investigated in a practical context with the involvement of SMEs and other stakeholders. Implementation of collaborative EWE risk management practices will require formation of a knowledge base accessible to the members of the SME communities. Specifications of the knowledge base and the intranet system will have to be established in context of the SME networks. Structure, accessibility, knowledge accumulation and sharing in the network etc give rise to innovative research opportunities. The paper lays the foundation and sets the way forward for more comprehensive studies with regard to the use of intranets in achieving collaborative EWE risk management in SME networks. As these issues have not been explored previously, there seems to be a number of research issues which need more focused attention particularly from construction industry participants.

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