

INTRANETS IN LARGE CONSTRUCTION ORGANISATIONS: EXPLORING ADVANCEMENTS, CAPABILITIES AND BARRIERS

SUBMITTED: February 2007

REVISED: July 2007

PUBLISHED: July 2007 at <http://itcon.org/2007/27/>

EDITOR: B-C Björk

Bingunath Ingirige, Dr.

Research Institute of the Built and Human Environment, UK

email: M.J.B.Ingirige@salford.ac.uk

Martin Sexton, Prof.

Research Institute of the Built and Human Environment, UK

email: M.G.Sexton@salford.ac.uk

SUMMARY: *The role of Intranets has changed significantly from a passive role of providing company information to its employees to a more dynamic role to share and capture knowledge. A review of the literature on Intranets reveals that some companies leverage them as tools for achieving sustainable competitive advantage. Recent studies done in the construction industry have also indicated that Intranets can have a significant impact on enhancing collaborative working. The paper investigates how Intranets can benefit the performance of large construction companies. The current state of developments in Intranet technologies are explained initially through a case study of a large multinational construction alliance and then, to broaden the understanding, a questionnaire survey of eight large construction firms in the UK is conducted. Intranets were found to have developed significantly in large construction firms. The Intranets experienced 'static' content through the provision of documentation templates for purposes of standardising practices throughout business units, organisational functions and various geographic locations, so that it results in achieving short term benefits such as quick setting up of projects, and short term time and cost savings. Only a few organisations indicated that they have incorporated dynamic functionalities, such as tools to capture good practice and provision of information targeting their specific tasks. The majority of the companies reported that their Intranets were not adequately utilised by their site staff and there was a wide variation in the usage between head offices and sites. This research identified various benefits of developing the dynamic content of Intranets and improving its usage across the whole organisation. It recommends appropriate process improvements and culture changes in these companies to enable this major change.*

KEYWORDS: *intranets, content development, knowledge sharing, collaboration, construction industry.*

1. INTRODUCTION

The construction industry plays a vital part of national economies in itself, as well as significantly influencing the efficiency and productivity of other industry sectors. The challenge to improve performance and reduce costs has prompted developments in a number of areas. Marsh and Flanagan (2000: 423), for example, state that "developments in electronic commerce offer the potential to radically change the structure of the construction industry and the way information is passed between organisations." Although the potential to improve performance exists, efforts are hampered due to the construction industry's fragmented structure and supply chain. (Anderson et al, 2000). The achievement of the required transformation is still a major challenge, requiring a steep learning curve. However, collaborative working in construction is gathering momentum as many construction activities are performed globally with project actors based in various geographical locations (Faraj et al, 2000; Anumba and Duke, 1997). Hassan and Mccafer (2002) report that both contractors and clients in construction perceive a significant increase in these collaboration activities in the future and, as a consequence, have been investing heavily on IT enabled communications and project management infrastructures. This is confirmed by some of the recent studies (see Hjelt and Björk, 2006; Nitithamyong and Skibniewski, 2006; Peansuppap and Walker, 2005; Acar et al, 2005; Alshawi and Ingirige, 2003). A primary response to this worldwide trend in the construction industry at the individual company level has been investment in developing Intranets (an Intranet is an inter-connected network within one organization that uses

Web technologies for the sharing of information internally within an organisation). By utilising Intranets, organisations have the ability to 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 & Scheepers, 2000).

The use of Intranets enables construction companies to focus primarily on improving performance at the individual company level and influence their organisation of activities when they undertake construction projects. The construction industry is a project based industry where firms perform / survive on a project-by-project basis. This very reality aligns with the capabilities of the Intranets as they can influence the process of gathering critical mass at the level of the company by enabling its members to share knowledge (Davenport et al, 1998; Davenport and Prusak, 1998). According to Davenport and Prusak (1998), Intranets are also envisioned as platforms for organisational knowledge management. Existing practices in the construction industry however hinder various measures being adopted to capture knowledge acquired in one project to be transferred and used by other projects. Although some firms in the construction industry are said to have various processes in place within their head offices to capture, share, use and exploit knowledge through Intranets, the contribution received by the project or site based staff in developing the use of Intranets has not been significant. Further, Construct IT (2003) reports of another dimension to this problem that since an organisation's Intranet users are local, they are not developed with an external customer focus. Intranets, as a consequence, are developed with the assumption that employees are 'insiders' who are able to easily locate company information by appropriate navigation. We contextualize this broad research problem in this paper and focus on how Intranets can be utilised as tools to improve performance in construction companies.

The paper is organised as follows. First it provides a review of literature on Intranets, which identifies their functionalities and usage characteristics in broad terms. This section also applies Intranets within the construction context and identifies research questions, which addresses how Intranets can be utilised as tools to improve performance in the construction industry. Then, the paper details the research methodology that is adopted and discusses a case study and a questionnaire survey of large construction companies. Finally, the conclusions are drawn.

2. INTRANETS AND ITS APPROPRIATENESS IN CONSTRUCTION

The objective of this section is to draw upon Intranet literature to provide insights on their use, applications and its appropriateness in the construction industry. Based on this, the section concludes with a number of research questions addressed in the remainder of the paper.

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. The concept of the Intranet emerged as a result of the need to popularise relevant company details such as performance, policies, the mission and vision to its employees. However, its functionalities have evolved to such an extent that the role performed by an Intranet varies 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 facilitatory 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.

Guenther and Braun (2001) provide examples of how Intranets can be utilised to download and upload information from / to the central databases. This enabled organisation wide sharing of information and knowledge through the Intranet. Curry and Stancich (2000) describe further functions of Intranets as encouraging information sharing, information publishing and facilitating document management.

Approaching intranet implementation with a traditional mindset may be the reason why some Intranets do not become successfully embedded within most of the organisations (Dasgupta, 2001). Findings of a survey conducted by Gartner group indicate that half of the respondents suggesting that although their intranets were deployed, they were by no means organisationally pervasive (Gartner Group, 1997). Further, Romm and Wong (1998) reported on problems of implementing an Intranet within an Australian University setting due to an insufficient level of information content. From an Intranet practitioners' perspective, Rein et al. (1997) note that the Intranet, as an environment for supporting organizational work, is significantly falling short of the expectations.

To gain an advantage out of the Intranet as a tool for knowledge sharing and capturing good practice within organisations, it is essential that it is populated with more dynamic content rather than static information. For the purposes of this paper we define static content as content that provides information without any personalisation to the individuals in the organisation (e.g. general news, company policies and procedures) and dynamic content as content that is personalised and enhances knowledge accumulation for individuals and for the organisation as a whole. Examples of static and dynamic content within a construction context are shown in Table 1.

TABLE 1: Examples of Static and Dynamic Content in Intranets

Static Content	Dynamic Content
1. Message of the day	1. Discussion forum
2. Company policies and procedures	2. Interactive demonstrations
3. Publications	3. Key word search for expertise
4. Project information	4. Indicating relevance for information access and submission
5. Company news	5. Methods of capturing knowledge
6. Project progress and significant achievements	
7. News letters	

As Guenther and Braun (2001) suggest, the popularity of the Intranet is a function of its rich content (rich content is defined here as an appropriate combination of dynamic and static content as indicated in Table 1) being related to the tasks carried out by people in the organisation. This enhances further participation by the community to enrich its content. Therefore the perceived effectiveness of the Intranet is determined through a combination of task relevance (see McGath, and Hollingshead, 1994) and its richness of media (see Daft and Lengel, 1986) factors. The appropriate combination of the two factors energises and is energised by the people who regularly benefit from the Intranet. Stodart (2001) points out that this process works effectively when the climate within which the Intranet operates is appropriate and promotes the population of the Intranet with content.

By investigating the broader issue of computer mediated communication (CMC), Jarvenpaa and Staples (2002) provide insights on how to increase peoples' meaningful participation in using CMC. According to the study, the overall participation depends on the personal propensities of individuals to share information. An influencing factor here might be experiencing comfort with particular technologies (which in this case is the Intranet) and the task relevance of the content already contained in the Intranet. Jarvenpaa and Staples (2002) study is aligned with characteristics of the Intranet and it shows that value can be gained out of Intranets by utilising them as knowledge capturing tools apart from being used as knowledge sharing tools. Further, Cabrera and Cabrera (2002) present approaches to making Intranets efficient based on the theory of 'public good dilemma.' A public good constitutes a shared resource from which every member of the public benefit, regardless of who contributes to its provision. The theory also states that any prolonged use of the 'public good' does not result in diminishing of its provision. Cabrera and Cabrera (2002) draw insights from the theory of 'public good dilemma' to present various ways in which the effective and efficient usage of Intranets can be enhanced. The aggregated findings of their study on making Intranets efficient are presented in Table 2.

As indicated in Table 2, the participation on populating and benefiting from the Intranet can be done in two ways. The first column indicates measures to reduce the barriers or opportunity costs of participation, while the second column is about drivers or incentives. On the other hand, the first column explains the media richness aspects of the Intranet and the second column explains measures to enhance the task relevance to the users of the Intranet. It is important therefore to devise an appropriate scheme to gain the advantage out of the Intranet by concentrating on both aspects.

TABLE 2: Measures to reduce cost of participation and increase benefits (adapted from Cabrera and Cabrera, 2002)

Cost reduction measures	Measures of increasing benefits
1. Make the Intranet technologically more efficient. e.g. incorporating a search facility, Inclusion of rated information results.	1. Devise collective benefits (gain sharing schemes)
2. Make more time available for the people to contribute	2. Participation contingent compensation (reward schemes)
3. Provide training on IT use	3. Provide a rating of relevance of the contribution as feedback to the contributor
	4. Publicise information about individual contributions.
	5. Reciprocity (to see others following)

The above discussion shows the utility of the Intranet in enabling knowledge sharing, capturing and use based on increased media richness and task relevance. Intranet technology therefore addresses the needs of the construction industry to develop collaboration at the organisational level and thereafter widen the scope towards projects and the industry as a whole. Studies on Intranet developments within the construction context have emerged (Zarli and Richaud, 1999; Hassan and McCaffer, 2002; Howard et al, 1998; Ribeiro and Love, 2003). The IT barometer survey done in the Scandinavian region (see Howard et al, 1998) revealed that the use of Intranets combined with the use of the Internet is gathering momentum. A relatively recent survey on e-business initiatives in the US (Issa et al, 2003) reveal that Intranets were identified by 65% of the respondents as a major e-business application (in 13 construction industry practices). According to Ribeiro and Love (2003) Intranets are becoming an integral part of the business strategy of many of the large companies, whereas Small and Medium Size enterprises, which constitute a significant proportion of firms in construction are struggling to invest in the new technology. According to Hassan and McCafer (2002) the use of Intranets will increase from the current 20% of the users to 40% in ten years, indicating the significant growth potential in the area. The studies conducted so far reveal the popularity of the Intranet as a predominant communication tool within construction companies (see Peansuppap and Walker, 2005; Acar et al, 2005). However, its functionality as a knowledge sharing and capturing tool has not received adequate attention in a systematic way considering its combined static / dynamic capabilities. Further, the capability of the Intranet as a tool that enables collaboration within organisations has not been studied in detail in the construction industry. In this paper we investigate the research problem of how construction companies can leverage the capability and the usage of the Intranet to improve their performance both within an organizational context and a project context.

The paper sets out the following research questions to investigate the above problem:

1. What is the degree to which Intranet technologies have been developed in construction companies?
2. What is the status of static / dynamic content associated with the Intranet?
3. What is the level of usage of the Intranet considering office staff and site / project staff?
4. What are the benefits and barriers of Intranet use?
5. What improvements in performance can be attributed due to Intranet use?

3. METHODOLOGY

3.1 Research Approach

We first conducted a case study to contextualise and to gain a deep understanding of the research problem of Intranet usage in the construction industry. Then, a questionnaire survey was carried out to broaden this understanding to determine the wider role played by Intranets both in large contracting and consulting companies in the UK. The two approaches complemented each other in the process of theory building on Intranet use. The theory building process in case studies commences with the identification of the initial research questions of the study. The research questions set out earlier aligned with Mintzberg's (1979: 585) argument that "no matter how small our sample or what our interest, we have always tried to go into organisations with a well defined focus". Partly this process addresses Eisenhardt's concerns that "without a research focus, it is easy to become overwhelmed by the volume of data" (Eisenhardt, 1989: 536). As part of the overall case study research design,

face-to-face interviews were held with senior managers (SMs) and project managers (PMs) within the case study company. Triangulation was achieved between data sources (two different levels in the managerial hierarchy) and data collection methods (utilising two different forms of interview guidelines). The questionnaire survey on the other hand targeted some of the leading contracting and consulting companies in the UK through the Construct IT (<http://www.construct-IT.org.uk>) database.

3.2 Sampling, Data Collection and Analysis

3.2.1 Case study

For the case study, we conducted Interviews lasting for more than one hour with the senior managers (SMs) and project managers (PMs). In total there were 20 Senior and Project Managers operating in the UK based offices of the XY Alliance (the case study company). Out of the total number of Managers, we interviewed 4 senior managers and 4 project managers. The SMs consisted of the UK country manager (SM1), network support manager (SM2), global health and safety manager (SM3) and maintenance manager (SM4). The four project managers consisted of two PMs working for the market launch section (new build) and the other two for the maintenance section. SMs were interviewed based on an open ended type of interview guideline and the PMs were interviewed based on a semi structured interview guideline.

3.2.2 Questionnaire survey

The questionnaire survey targeted the membership of Construct IT (<http://www.construct-IT.org.uk>) as the sample for Intranet use. The members of construct IT have special interests in the overall IT applications in construction. We carried out the survey (see appendix for the survey template used) in one of its members meetings held in Manchester, UK in November 2006. Out of the forty questionnaires distributed to a selected membership panel, fifteen were returned. As we had to match parameters such as the organisation size, launch date of the Intranet and number of employees we reduced the number of questionnaires considered for this study to eight. The eight companies selected were large companies as per the selection criteria for the project (annual turnover in excess of £50 million and employee numbers in excess of 300).

The respondent profiles in the questionnaire survey are given in Table 3 and Responses to the main questions are given in Table 4.

TABLE 3: Profiles of survey respondents

Respondents	A	B	C	D	E	F	G	H
Contractor / Consultant	Contractor	Consultant	Contractor	Consultant	Contractor	Contractor	Consultant	Contractor
Annual Turnover	£350 million	£160 million	£3 billion	Not disclosed	Not disclosed	£4 billion	Not disclosed	£3 billion
Number of Employees	3000	2800	10000	350	2000	27000	350	5000
Intranet launch year	2001	2000	1998	1998	2000	2001	2000	2001

TABLE 4: Some highlights of survey responses

Company	A	B	C	D	E	F	G	H
Responsibility to maintain Intranet	IT dept	Various heads of the company	Manager, IT Dept	IT Dept.	IT Dept.	IT project manager	Members of a team at associate level	outsourced
Intranet users	All staff	All staff	All staff	All staff	All staff	Everyone except site staff	All staff	Everyone except site staff
Personal contributions to the Intranet by interview respondent	None	Project updates, sector best practice	Top tips for construction	None	Health and safety updates	Content in community areas	Technical editor and contribute to some of the sections	None
Performance improvement due to Intranet	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes

As indicated in Table 3, five construction contractors and three construction consultants participated in the survey. Table 4 shows some of the highlights of the 8 respondents in terms of Intranet usage. These highlights

will be discussed in Section 5 of the paper. The next section of the paper provides a background to the case study.

4. BACKGROUND TO THE CASE STUDY AND LAUNCHING OF THE INTRANET

XY alliance (the name is withheld for purposes of confidentiality) is an organisation between a petroleum retail company (X Company) and a construction project management company (Y Company). The alliance operations started in 1996 in UK and spread to 12 countries based on its success in cost savings in building and maintenance of petrol stations. Its head office is in the USA. The overall intent of the alliance agreement is to create a relationship to develop innovative business solutions to progress their objectives of earning cost savings and productivity improvements.

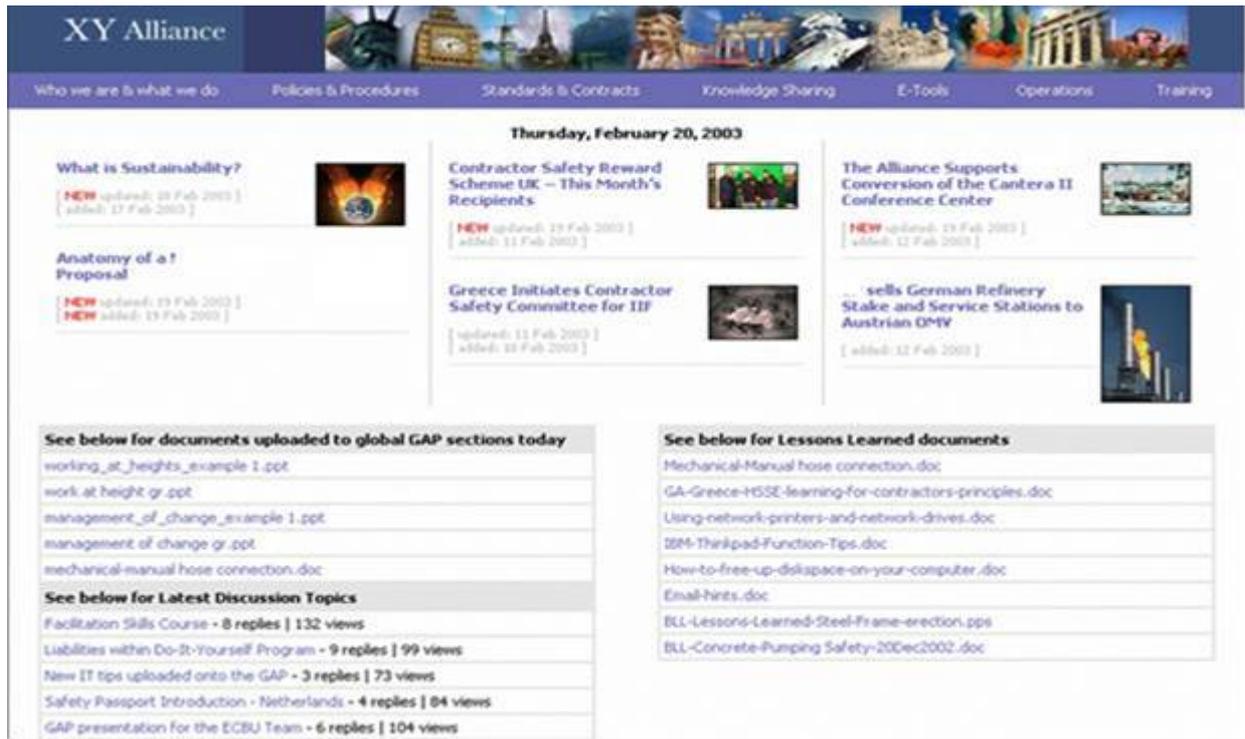


FIG. 1: The front page of the Intranet used by the XY alliance

The main task of the XY alliance is to design, construct and in some instances maintain petrol stations (including the forecourts and convenience stores). The design and construction work often involves standardised prefabricated construction. The Senior Managers of the XY Alliance had responsibilities to deliver some of the core tasks of the alliance consisting of new build, maintenance work and health and safety. The main tasks of the project managers were to plan and schedule work with specialist sub-contractors for both new build and health and safety. The specialist sub-contractors for both new build and maintenance had a lot of synergies with other types of construction contractors, however there was a mandatory requirement that they have to hold a special licence to work in petrol stations. The services of specialist subcontractors were obtained through a register depending on the area that the activity (new build or maintenance) was taking place. The scope of the case study was limited to the XY Alliance, therefore, the operations of the specialist contractors were not considered as part of the case study.

The Intranet at XY Alliance was launched in September 2002, which is accessible from any office belonging to the XY Alliance. Use of a web platform for the Intranet facilitates more effective collaborations and knowledge sharing by making available a lot of information for the global team. One of the important services that the Intranet attempts to develop is a web based health and safety management program. Based on the number of hits that has been monitored the usage level has been increased since its launch in September 2002. Front page of the Intranet is presented in Fig. 1.

The XY Alliance Intranet in Fig. 1 shows the existing functionalities. The training menu on the top right hand corner provides the web based health and safety management programme. The figure also shows some of the lessons learnt documents, discussion topics in the discussion forum, and various news items.

5. DISCUSSION OF RESULTS

The discussion is based on the five research questions raised in Section 3. The case study results together with the questionnaire survey results helped to gain a broader understanding of Intranet utilisation particularly within large construction companies.

5.1 Research question 1: What is the degree to which Intranet technologies have been developed in construction companies?

5.1.1 Case study results

Both the SMs and PMs viewed the introduction of the Intranet as part of a worldwide strategy to standardise practices and procedures across the XY alliance. They also observed that similar multinational alliance organisations (alliances between oil and construction companies) were undergoing a similar pattern of Intranet development and these developments were seen as means of gaining competitiveness in the market. The main aim was to standardise templates for office procedures, company policies and processes. Before Intranets and web technology was developed, multinational companies had problems in achieving standardisation of the documents and, instead, they operated stand alone applications for each location and document transfer between their international offices and business units was paper based. Therefore Intranet developments were perceived by the SMs and PMs as having a major impact on company performance as it enabled standardisation of organisational processes and services they offer, hence the widespread development of this technology.

5.1.2 Questionnaire survey results

The survey results reveal that the Intranet launch dates of the eight respondents were fairly uniformly distributed indicating an even level of maturity. The Intranets launch years varied from 1998 – 2001 (see Table 3). Therefore Intranet technology has spread significantly within large construction companies (both contracting and consulting) in the UK. Further, all the respondents stated that their Intranets were serviced by an internal network administrator or a specialist technician having knowledge and experience of Intranet maintenance (except for Company H, which outsourced its Intranet maintenance – see Table 4). The technological applications have advanced and they are being built up on developments in various applications and web platforms.

5.2 Research question 2: What is the status of static / dynamic content associated with the Intranet?

5.2.1 Case study results

Case study results indicate that the main purpose of the Intranet was to use it as a tool to share static information within the XY Alliance. Therefore the Intranet contained regular news items, message of the day, various awards received by the company and individuals, company policies and procedures, standard templates used over the world and publications indicating good practice (see Fig. 1). The Intranet also contained an expertise search facility which was at the developing stage. The SMs perceived that level of Intranet usage was significantly low, which has resulted from its lack of information content specific to the tasks performed by the team. Intranet was seen as a method by which the alliance publicised news. For example, if a team is successful in generating an innovation, the results are published in the Intranet giving recognition to the people behind it. Before the results are published, some of the team members, including PMs, are involved in disseminating results through internal workshops. Usually the publication in the Intranet follows the format of a news item and does not indicate adequate background information to classify as transferring of good practice. One of the PMs pointed out that the Intranet does not communicate the methodology in which the new innovation or the new item of knowledge is going to influence their existing processes. SMs and PMs agreed that the Intranet content needs to be constantly revised and revitalised to achieve more task relevance of the Intranet. This was indicative of the following SM statement:

“If someone wants to know about tank lining in a fuel storage tank, that person has to read a full paper on tank lining available in the Intranet. Therefore people don’t have time to use the intranet therefore the Intranet does not contain specific information (relevant to my task).”

The above statement indicates that the Intranet did not cater to most of the individual needs of the SMs. The PMs also considered the Intranet as a portal to display ‘company news’ to its employees. Some of the SMs and PMs did not consider the Intranet as a tool that could be personalised to individual needs. As a consequence it was heavily populated with static content and disjointed from the majority SM and PM work practices. The overall view therefore was that the significant volume of static content affected cost savings in not having to circulate hard copy information from time to time to the employees and as a result of this activity, they were able to spread good document control procedures throughout the offices of the XY Alliance.

5.2.2 Questionnaire survey results

The findings reveal that despite the similarities of the level of maturities of the Intranets, the features that it consisted in terms of static / dynamic content were fairly diverse. For example, one of the respondents commented that their Intranet had the capability of performing live broadcasts (including voice and video). The static features such as disclosure of company policies, company news, project progress, message of the day were common among the survey respondents. The dynamic features indicated in Table 1 were only available within few of the companies surveyed and the availability of features classified as highly dynamic (e.g. interactive demonstrations and relevance indications for access and submitting content to the Intranet via electronic form filling) were found only in one or two companies surveyed. This trend is displayed in Fig. 2, with 25% (two companies) of the companies having the facility for interactive demonstrations and only one company (12.5%) having the capability of capturing good practice / knowledge through electronic form filling within their Intranet.

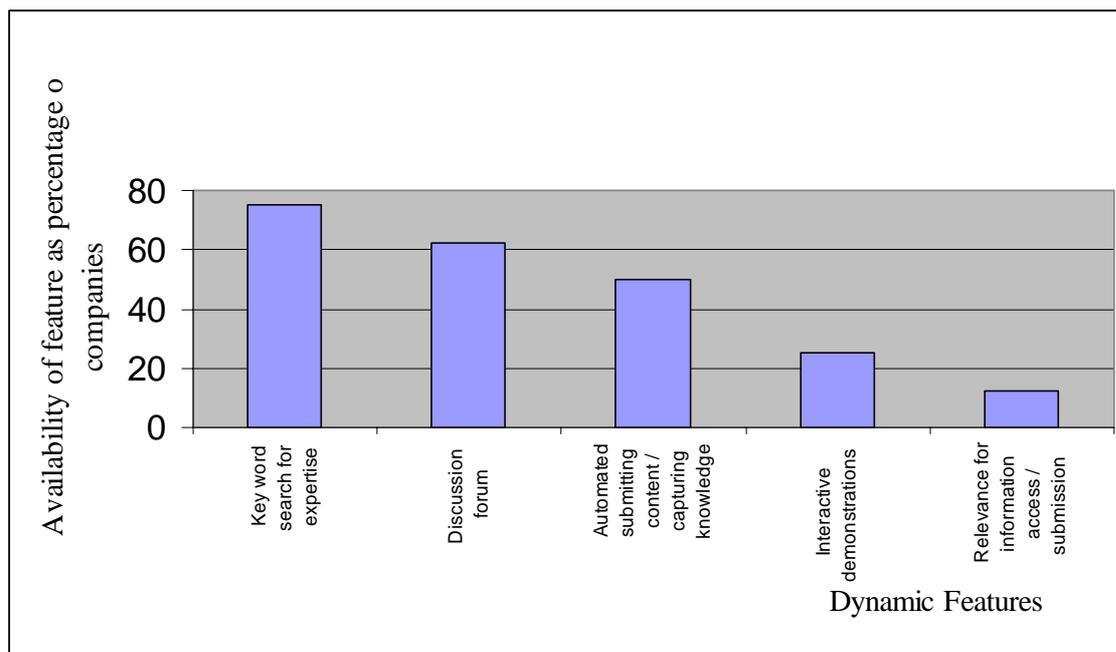


FIG. 2: Dynamic features available on the Intranets

As indicated in Fig. 2, out of the eight large scale construction companies, only two had the dynamic features at the higher end of the scale. This represents the difficulties and constraints in allocating resources to establish more dynamic content in the Intranet.

5.3 Research question 3: What is the level of usage of the Intranet considering office staff and site / project staff?

5.3.1 Case Study results

The majority of the senior managers were operating from the head offices, while the project managers interacted with the specialist contractors employed at site on a day to day basis. The specialist contractors for both new

build and maintenance work were drawn from regional registries maintained by the XY Alliance. The company Intranet was perceived as residing within the offices of XY Alliance and mainly populated information relating to the performance of the company as a whole and project information was presented in a form that contributes to the status of overall company performance (e.g. new outlets, progress of construction, profitability and health and safety reports). This information did not benefit the project managers as it did not provide specific site based information that would enable them to access information on a more regular basis. As one of the SMs, for instance, stated that:

“We have developed the Intranetas communication medium(s) and not as part of the process that we work on.”

The above statement indicates that both the SMs and PMs have to allocate separate times to populate any Intranet content that might assist other colleagues in their work practices. The daily routines of the PMs in particular involve detailed site driven tasks and activities to be carried out. Due to the emphasis on achieving the multiple project objectives on a day to day basis, the SMs and PMs were not released with adequate spare capacity to deploy their resources on activities that enrich the Intranet content. The XY Alliance head office in the UK consisted of a team to populate content of the Intranet depending on the various functions. For example, one of the SMs was responsible for populating content related to health and safety, another was responsible for UK level performance statistics and another was responsible for maintenance data on the Intranet. The site based PMs were not tasked with responsibilities of maintaining their project level interests on the Intranet. Hence the low usage by PMs, who viewed it as a source of providing static information, which is not relevant to their tasks.

5.3.2 Questionnaire survey results

A majority of the survey respondents indicated that the Intranet is available to all the staff in their companies for access (see Table 4). However, populating the Intranet was seen as the responsibility of a selected category of staff. A majority of the respondents identified that the populating of the Intranet was the job of the Intranet administrator or specialist IT staff. One of the respondents stated that their company nominates specialist technical staff to upload content to the Intranet from time to time. Site based staff in particular had very low level of involvement in populating the Intranet (only 1 respondent representing a contractor identified that their site based junior and senior managers upload content to the Intranet on a regular basis). The survey results therefore indicate that Intranets provide a head office based service to the construction companies. The construction sites are often under represented when developing the Intranets. Although sites have the potential to provide input towards the dynamism of the Intranet content (e.g. knowledge relating to specific aspects of construction, health and safety issues, specific core expertise needed for construction), this aspect does not receive adequate attention of the senior management.

5.4 Research question 4: What are the benefits and barriers of Intranet use?

5.4.1 Case study results

The main benefits reported by the case study are the standardisation of documentation and the ability of the people to get up to date company information relating to its overall progress and performance due to the utilisation of Intranets. The case study alliance as a whole perceived that the change that needs to be implemented to move away from a static content emphasis to a dynamic content emphasis was a steep learning curve to achieve. The main barrier therefore was changing the mindset of the people on their belief that the Intranet was merely a communication tool rather than a knowledge capturing or sharing tool. There was no strategy in place either as a cost reduction measure or a benefit maximising method (as per Table 2) to improve the utilisation of the Intranet within the alliance.

Principally, both the SMs and PMs agreed that the Intranet content should be improved in qualitative terms so that the benefits associated with more dynamic content becomes apparent to them. However, the SMs did not evolve any strategies to influence the effective and efficient utilisation of the Intranet within the alliance as they did not perceive any short term benefits being realised, which could be matched with deploying more resources for the activity. The longer term returns did not receive much attention of the SMs and any time allocation to enrich the Intranet use particularly among PMs was considered as inappropriate use of resources. Therefore the inadequacy and lack of quality content create a barrier for developing and sustaining the Intranet use. The reduction in the number of cycles that the Intranet is populated has impacted its richness and its usefulness as a knowledge sharing and capturing tool.

5.4.2 Questionnaire survey results

Survey results as shown in Fig. 3 indicate how the access and populating the Intranet realises in benefits as identified by the respondents.

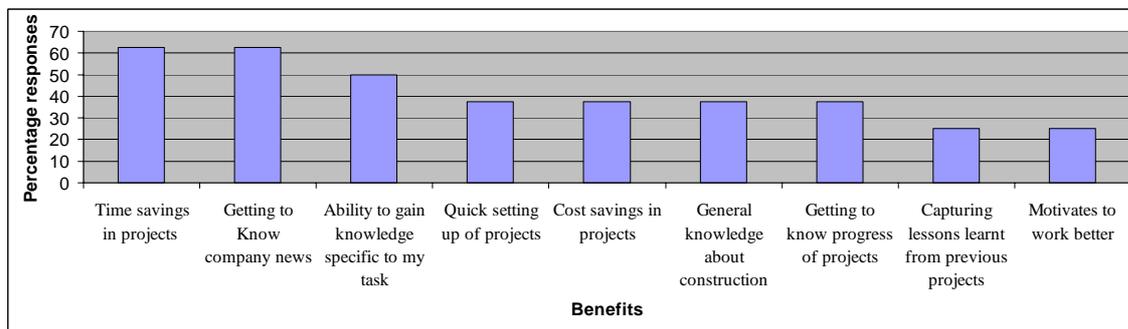


FIG. 3: Benefits of Intranet use

As shown in Fig. 3, the majority of the respondents stated that the major benefit that they gain is time savings in projects and getting to know company news from time to time. One of the respondents stated that their company is able to achieve consistency of practices across all geographic locations when they are working with the same client. They were able to standardise their work processes through the practices and procedures available on the Intranet. Only two of the respondents perceived benefits such as capturing of lessons learnt from previous projects and stated that the Intranet motivates them to work better, thereby identifying their intranet as a knowledge capturing and motivating tool. The time savings in projects (the overall time saving) and quick setting up of projects (the time savings at the front end of the project) and cost savings is related mainly to standardisation of documents in the Intranet, so that the PMs were able to expedite the management processes particularly at the setting up stage of projects. 50% of the respondents stated that they get information relevant to their tasks. The majority of these respondents were either senior managers or IT directors of large construction firms. This indicates that Intranets have undergone a significant development in terms of its content. However, the survey did not gain the perspectives of the junior managers or site staff of the large companies to test whether this benefit is realised by people across all levels of management or whether it is significantly senior management orientated. The barriers that these companies are facing are evidenced through the few responses received for the content development targeting the capturing of lessons learned, knowledge sharing and motivation (see Fig. 3 above).

5.5 Research question 5: What improvements in performance can be attributed due to Intranet use?

5.5.1 Case study results

At the time of the study, the Intranet was being launched and both SM and PM perspectives did not indicate any performance improvement as a result of Intranet use. However, both SMs and PMs perceived short term benefits out of standardised use of documentation and some of the processes enabled through the Intranet. None of the interviewees identified any anticipated long term performance improvement as a result of Intranet use.

5.5.2 Questionnaire survey results

The survey findings reveal the low capability maturity of the company Intranets and the potential capability improvement that is available in the future. There was very little integration between head office and sites in Intranet usage.

Seven respondents identified that the Intranet has the capability to potentially improve performance of their company (see Table 4). Time savings and quick set up of projects were the most common responses for areas of performance improvement, which were mainly project orientated improvements. Two of the respondents stated that although they perceived performance improvement, they cannot readily attribute this improvement as caused by the existence of the Intranet. The respondents further stated that they frequently encounter difficulties in measuring performance. A few respondents identified the following as probable direct benefits arising from Intranet use:

1. Having technical and company information easily accessible saves time and encourages researching for best answers.
2. Consistency of approach as stipulated in the Intranet assists in developing brand standards
3. Significant lessons learnt in the past are beneficial in preparing for future projects.
4. There is a tendency of greater adherence to company procedures by the people.
5. There is a greater degree of discipline in publishing documents and it minimises errors as there is version control and audit trail facility in the document management system.

6. COMMENT AND SYNTHESIS

Both the case study and survey results indicate that Intranets have developed widely among large construction companies and they are seen as having a major impact on their performance. The research concentrated on large companies and the finding that Intranets are becoming widespread, corroborate with studies done by Hassan and McCafer (2002), Peansuppap and Walker (2005) and Acar et al (2005). The results also indicated that managers of these companies believe that the Intranet is becoming a standard tool for ensuring standardised practices across all international and national projects. One of the survey respondents highlighted that they leverage the Intranet to ensure consistency of approach, which assists in developing brand standards within their worldwide offices.

Although Intranets have been adopted widely by large construction companies, their developments have not yet made adequate changes in its nature of content and there is significant potential for improvement. We found that most of the Intranets were populated with static content rather than dynamic content. Hence its capability did not adequately address the capturing of good practices and enabling knowledge sharing within their companies. Therefore the Intranets utilised were far from being envisioned as knowledge management platforms as Davenport et al (1998) noted. Various stakeholders of large construction firms stated that from a project perspective, achievement of a consistent approach to develop their product and service standards alone is a major achievement in the construction industry, which justifies investments on Intranets. The companies also valued the functionality of the Intranet that enable them to achieve quick setting up of projects with a standardised approach across all projects that they carry out within their organisation.

Both the case study and the survey identified that on most occasions populating of the Intranet with content was assigned to a job holder known as "Intranet administrator". Some companies appointed technicians from time to time to fill in the role. The Intranet administrator gathered all the information that might be useful to different people in the organisation and populated the Intranet working along with the SMs. The Intranet was also perceived as a head office based tool and the site employees had very little input in populating the content. The senior managers generally found that some of the Intranet functionalities catered to their jobs rather than the junior managers'. The problem of not having dynamic content became more acute due to the low usage of the Intranet by the site based project managers in large construction firms. The overall results indicate that to achieve a higher value out of Intranets, its dynamic to static balance should be improved to cater to task relevance of its users, which energises the usage cycle further.

The overall findings identify several benefits to large construction firms realised out of Intranets. Some of these were easily identified in terms of effective and efficient construction project delivery. But others were difficult to attribute to Intranets on its entirety. The study also recognised that investment alone will not popularise Intranet use in construction companies. The various change management strategies undertaken by companies, which are associated with both the aspects of technology and culture seem to realise in long term performance improvements. The organisation strategy should therefore take into account an appropriate culture change to alter the mindset of the people that task relevance of the Intranet content is dependent on their usage and population. However, media richness factors also impact this change as companies need to create user friendly interfaces to enable employees to populate content. To prove the benefit of such an exercise, one of the survey respondents revealed that the Intranet has become a strong motivating tool for higher performance because of its rich media qualities and task relevance. As identified in our initial conceptualisation of the problem in this paper, the construction companies perception that their employees in head offices and sites being 'insiders' who do not need user-friendly interfaces to the degree that external customers do, still remains a major barrier in developing Intranets. This study shows the necessity of an organisation wide approach to address this problem as Intranets are being positioned as performance drivers. The study also recognises that the case study alliance dealt with relatively non-complex construction work, whereas some of the survey companies dealt with complex design

and construction work. As part of further research, it might be useful to investigate whether the utility of the Intranet is aligned more towards activities and tasks which are more complex and labour intensive rather than construction activities that are less complex.

7. CONCLUSIONS

Intranets are emerging as effective tools for knowledge capturing, sharing and use. We contextualised the use of Intranets within large companies in the construction industry to investigate to what extent they have developed. A case study was conducted to explore detailed applications within a large construction company. Thereafter a questionnaire survey was conducted among eight large construction firms by targeting the construct IT data base. The overall results reveal that Intranet technology has spread across the companies quite rapidly mainly as a tool to benefit from its static content rather than its potentially valuable high impact dynamic content. This is mainly due to the companies taking a project based perspective by concentrating on quick setting up of projects to achieve time and cost savings, which are short term project based goals. It was also found that the involvement of the site / project based staff was very low in both the case study company as well as the survey companies. The Intranets therefore have the potential to encourage more and more users to participate in their use. This practice will enable the organisations to leverage the Intranets as knowledge sharing and capturing tools leading to longer term orientated performance improvement.

The case study results provide the necessary support to the theoretical justification that alliance tasks and activities are overly short term orientated and that there is inadequate emphasis on leveraging the dynamic to static content and optimising user involvement to gain performance improvement in organisations. It was also found that the tasks and activities of the people conducted on a routine day-to-day basis do not adequately harmonise with the use of the Intranet. The results reveal that populating the Intranet was perceived as an additional task that needs deployment of more resources and the activities that drive the alliance on a day-to-day basis do not allow adequate spare capacity due to the scarcity of resources. Therefore, these factors work towards building up the Intranet as a static information repository rather than a dynamic knowledge resource for construction companies harmonising with their work processes. Results also revealed that responsibility of Intranet maintenance rests with the head office and the sites are under represented. This highlights a weakness in the strategy of large companies in the construction industry.

The study indicates opportunities for both site based project managers who are at the front end of construction projects and senior managers for capturing and sharing new findings, innovations or shared project based knowledge via the Intranet. As the longer term benefits of Intranets in construction companies are achieved when their usage is effectively spread among all levels of workers, the activities connected with the Intranet usage should therefore receive the strategic consideration of the management. The appropriate return on investment on Intranets and achievement of competitive advantage for the alliance will not be achieved if the existing practices were not streamlined and there was equity in spread of usage of the intranet within the companies. This change could only be realised through a combined technology and culture based strategy to address improvements in both media richness and task relevance attributes of Intranet development to improve overall performance in the construction industry. In broad terms the paper contributes to theory and practice by identifying the potential value of linking the role of Intranets with the competitive strategies within the domain of large construction companies. From a research perspective, the paper also identifies potential further research on performance measurement due to Intranet implementation that can have a significant long term impact in the construction industry.

8. REFERENCES

- Acar E., Koçak I, Sey Y. and Arditi D. (2005). Use of information and communication technologies by small and medium sized enterprises (SMEs) in building construction, *Construction Management and Economics*, Vol. 23, No. 7, 713 – 22.
- Alshawi M. and Ingirige B. (2003). Web enabled project management: an emerging paradigm, *Automation in construction*, Vol. 12, No.4, 349-364.
- Andersen J., Baldwin A., Betts M., Carter C., Hamilton A., Stokes E. and Thorpe T. (2000). A framework for measuring IT innovation benefits, *ITCON Journal*, Vol. 5, 57–72, <http://www.itcon.org/2000/4>.
- Anumba C.J., Ugwu O.O., Newnham L., Thorpe A. (2002). Collaborative design of structures using intelligent

- agents, *Automation in Construction*, Vol. 11, No. 1, 89 – 103.
- Anumba C.J. and Duke A. (1997). Internet and intranet usage in a communication infrastructure for virtual construction project teams, *Journal of Engineering and Applied Science*, Jun 18-20, 56-61.
- Bernard R. (1996). *The Corporate Intranet*, John Wiley & Sons, New York.
- Cabrera A. and Cabrera E.F. (2002). Knowledge-sharing dilemmas, *Organisation studies*, Vol. 23, No.5, 687 – 710.
- Ciborra C. U. (1996). *Groupware and Teamwork: Invisible aid or technical hindrance*, Wiley: Chichester.
- Construct IT. (2003). *How to set up an Intranet*, Construct IT for Business, <http://www.construct-it.org.uk>.
- Construct IT. (2006) <Http://www.construct-it.org.uk> (accessed on 12/12/2006)
- Curry A. and Stancich L. (2000). The intranet – an intrinsic component of strategic information management, *International journal of information management*, Vol. 20, No.4, 249 – 268.
- Daft R.L. and Lengel R.H. (1986). Organizational information requirements, media richness and structural design, *Management Science*, Vol. 32, No. 5, 354 – 567.
- Damsgaard J. and Scheepers R. (2000). Managing the crises in intranet implementation: a stage model, *Information Systems Journal*, Vol. 10, No. 2, 131-149.
- Dasgupta S. (2001). *Managing Internet and Intranet Technologies in Organizations : Challenges and Opportunities*, Idea Group Publishing, New York.
- Davenport T.H. and Prusak L. (1998). *Working knowledge*, Harvard Business School press, Cambridge, MA.
- Davenport T.H., DeLong D.W. and Beers M.C. (1998). Successful Knowledge Management Projects, *Sloan Management Review*, Vol. 39, No.2, 43 – 57.
- Egbu C. O. and Botterill K. (2002). Information technologies for knowledge management: their usage and effectiveness, *ITCON Journal*, Vol. 7, Special issue, 125-137, <http://www.itcon.org/2002/8>.
- Eisenhardt K.M. (1989). Building theories from case study research, *Academy of management review*, Vol. 14, No. 4, 532 – 550.
- Faraj I., Alshawi M., Aouad G., Child T. and Underwood J. (2000). An Industry Foundation Classes Web-Based Collaborative Construction Computer Environment: WISPER. *Journal of Automation in Construction*, Vol. 10, No.1, 79-99.
- Gartner Group. (1997). Meeting the intranet challenge: Technologies, organizations, processes. *Inside Gartner Group this Week*, Vol. 13, No.49, 1-4.
- Grudin J. (1994). Groupware and social dynamics: Eight challenges for developers, *Communications of the ACM*, Vol. 37. No.1, 93 – 105.
- Guenther K. and Braun E. (2001). Knowledge management: benefits of intranets, *Online*, Vol. 25, No. 3, 17-22, <http://www.online.com>.
- Hassan T. M., McCaffer R. (2002). Vision of the large scale engineering construction industry in Europe, *Automation in Construction*, Vol.11, No. 4, 421-437.
- Hjelt M. and Björk B. (2006). Experiences of EDM usage in construction projects, *ITCON Journal*, Vol. 11, Special issue, 113-125, <http://www.itcon.org/2006/9>.
- Howard R., Kiviniemi A. and Samuelson O. (1998). Surveys of IT in the construction industry and experience of the IT Barometer in Scandinavia, *ITCON Journal*, Vol. 3, 47-59, <http://www.itcon.org/1998/4>.
- Ingirige B. and Sexton M. (2006). Leveraging intranets for knowledge sharing and learning within construction alliances, in Pietroforte, R., De Angelis E. and Polverino, F (Eds), Proceedings of the CIB Congress 2006, October 2006, Rome, Italy.
- Issa R.R.A., Flood I. and Caglasin G. A. (2003). Survey of e-business implementation in the US Construction Industry, *ITCON Journal*, Vol. 8, 15-28, <http://www.itcon.org/2003/2>.

- Jarvenpaa S. L. and Staples D.S. (2002). The use of collaborative electronic media for information sharing: an exploratory study of determinants, *Journal of strategic information systems*, Vol. 9, No. 2/3, 129 – 154.
- Marsh L. and Flanagan R. (2000). Measuring the costs and benefits of information technology in construction, *Engineering Construction and Architectural Management*, Vol. 7, No.4, 423-435.
- Massey A.P., Montoya–Weiss M. M. and Hung Y. (2003). Because time matters: Temporal coordination in global virtual project teams, *Journal of management information systems*, Vol. 19, No. 4, 129-155.
- McGrath J.E. and Hollingshead A.B. (1994). *Groups Interacting with Technology*, Sage publications, London.
- Mintzberg H. (1979). An emerging study of direct research, *Administrative science quarterly*, Vol. 24, No. 4, 582 – 589.
- Nitithamyong P. and Skibniewski M. (2006). Success/failure factors and performance measures of web-based construction project management systems: professionals' viewpoint, *ASCE Journal of Construction Engineering and Management*, Vol. 132, No. 1, 80-87.
- Offsey S. (1997). Knowledge management: linking people to knowledge for bottom line results, *Journal of Knowledge Management*, Vol. 1, No. 2, 113-122.
- Peansuppap V. and Walker D.H.T. (2005). Factors enabling information and communication technology diffusion and actual implementation in construction organisations, *ITCON Journal*, Vol. 10, 193-218, <http://www.itcon.org/2005/14>.
- Rein G.L., McCue D.L. and Slein J.A. (1997). A case for document management functions on the Web, *Communications of the ACM*, Vol. 40, No. 9, 81–89.
- Ribeiro F.L. and Love P.E.D. (2003). Value creation through an e-business strategy: implication for SMEs in construction, *Construction Innovation*, Vol. 3, No. 1, 3-14.
- Robinson H.R., Carrillo P.M., Anumba C.J. and Al-Ghassani A.M. (2004). Developing a business case for knowledge management: the IMPaKT approach, *Construction management and economics*, Vol. 22, No. 7, 733 – 743.
- Romm C.T. and Wong J. (1998). The dynamics of establishing organisational websites: some puzzling findings, *Australian Journal of Information Systems*, Vol. 5, No. 2, 60-88.
- Sheepers R. (2003). Key roles in intranet implementation: the conquest and the aftermath, *Journal of Information Technology*, Vol. 18, No. 2, 103-119.
- Stodart L. (2001). Managing intranets to encourage knowledge sharing: opportunities and constraints, *Online information review*, Vol. 25, No.1, 19-28.
- Yin R. K. (2003). *Case study research: design and methods*, Third edition, Sage publications, London.
- Zarli A. and Richaud O. (1999). Requirements and technology integration for IT based business-oriented frameworks in building and construction, *ITCON Journal*, Vol. 4, 53-75, <http://www.itcon.org/1999/4>.

APPENDIX

Questionnaire Survey On Intranet Utilisation and its Impact on Performance

Note: This survey facilitates data collection for the research titled, “INTRANET UTILISATION AND ITS IMPACT ON PERFORMANCE”. All responses will be treated in confidence. Thank you for your time and support.

SECTION A – GENERAL QUESTIONS

(i) Name:

(ii) Designation / Role:

(iii) Company:.....

(iv) Whether contractor / consultant / developer / Client organisation etc.,:

.....

(v) Address: **(vi) Telephone:**

..... **(vii) Fax:**

..... **(viii) Email:**.....

(ix) Date:

(x) Number of Employees in Local Office: (Approx. figure)

(xi) Number of Employees in the whole organisation: (Approx. figure)

(xii) Annual Turnover of the company £ (Approx figure)

(Since your company name and individual names are not disclosed in this study, responses to iv, x, xi and xii may specifically help in describing your company under data analysis and discussion)

SECTION B – SPECIFIC QUESTIONS

(please tick the appropriate box and / or write your answer in the spaces provided)

1. Do you have an Intranet / Intranets in your company?

- YES NO

2. If NOT, then does your company use an Electronic Discussion Forum (EDM) facility?

- YES NO

If you have answered ‘yes’ to either or both of questions 1 or 2 please proceed to question 4, if not please answer question 3 and complete your survey.

3. Do you anticipate to launching an Intranet in your company in the future?

- YES NO

4. When was the Intranet / EDM facility launched (approximate timing)?

In (state month / year, if known)

5. What are the Intranet’s existing features?

- | | |
|--|--|
| <input type="checkbox"/> Discussion forum facility | <input type="checkbox"/> Publicise company news |
| <input type="checkbox"/> Progress of projects | <input type="checkbox"/> Publicise good practice examples |
| <input type="checkbox"/> Expertise search facility | <input type="checkbox"/> Include various publications |
| <input type="checkbox"/> Demonstrations (e.g. H & S) | <input type="checkbox"/> Company policies and standard documentation. |
| <input type="checkbox"/> Message of the day | <input type="checkbox"/> Quick ways of submitting content (e.g. electronic form filling) |
| <input type="checkbox"/> Percentage relevance for information access | <input type="checkbox"/> Other (State) |

.....
.....
.....
.....

6. What is the designation / role of the person responsible for the Intranet maintenance? (Please state)

.....

7. Who are the Intranet users in your company?

- | | |
|--|--|
| <input type="checkbox"/> Board Level Executives | <input type="checkbox"/> Site Junior Manager |
| <input type="checkbox"/> Head office Senior Managers | <input type="checkbox"/> Administrators in General |
| <input type="checkbox"/> Head Office Junior Managers | <input type="checkbox"/> Special IT related staff |
| <input type="checkbox"/> Site Senior Managers | <input type="checkbox"/> Other (State below if a different category) |

.....

8. Name the employee category responsible for populating the Intranet content and state to what degree (approximately) this is done.

EMPLOYEE CATEGORY	USAGE		
	High	Medium	Low
1. Intranet administrator	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Board Level Executives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Special IT related staff (head office)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Special IT related staff (site based)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Other Administrators (site / office)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Senior Managers (head office based)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Junior Managers (head office based)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Senior Managers (site based)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Junior Managers (site based)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Other category.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Other category	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

.....

9. What benefits do you gain from the Intranet?

- | | |
|--|--|
| <input type="checkbox"/> Quick setting up of projects | <input type="checkbox"/> General knowledge about construction |
| <input type="checkbox"/> Time savings in projects | <input type="checkbox"/> Ability to gain knowledge specific to my task |
| <input type="checkbox"/> Cost savings in projects | <input type="checkbox"/> Getting to Know company news |
| <input type="checkbox"/> Capturing lessons learnt from previous projects | <input type="checkbox"/> Getting to know progress of projects |
| <input type="checkbox"/> Motivates to work better | <input type="checkbox"/> Other (State) |

10. Do you contribute regularly to the Intranet?

- YES NO

If YES, briefly describe your contributions

.....
.....
.....

If you DO NOT contribute regularly, please give reasons.

- | | |
|---|---|
| <input type="checkbox"/> No authorization | <input type="checkbox"/> Not part of my employment contract to do so. |
| <input type="checkbox"/> Lack of time | <input type="checkbox"/> methods do not exist to contribute readily |
| <input type="checkbox"/> Unclear guidelines | <input type="checkbox"/> Complicated technology |
| <input type="checkbox"/> Lack of incentives | <input type="checkbox"/> Intranet not user friendly |
| | <input type="checkbox"/> Other (State) |

11. Do you perceive any overall performance improvement due to use of Intranets in your company?

- YES NO

12. If so, in what way do you see performance improvement in your company AS A RESULT OF INTRANET USE?

- | | |
|---|---|
| <input type="checkbox"/> Increasing profitability | <input type="checkbox"/> Overall improvement of employee satisfaction |
| <input type="checkbox"/> Increasing market share | <input type="checkbox"/> Quick setting up of projects |
| <input type="checkbox"/> Time savings in projects | <input type="checkbox"/> Quick access to employee expertise |
| <input type="checkbox"/> Cost savings in projects | <input type="checkbox"/> Learning from previous mistakes |
| <input type="checkbox"/> Better procurement | <input type="checkbox"/> Other (State) |

Provide more details for the above responses:

.....
.....
.....
.....
.....

SPACE FOR ADDITIONAL COMMENTS

If any of your comments relate to a specific question, please write the question number.