ABSTRACT

The construction industry as other industries is exposed to considerable advancement in information technology. Construction companies are no longer judged exclusively by the level of their past performance but also how they can sell their expertise and services by employing the latest technology. Investment in new hardware and software technologies is necessary to gain a competitive edge but this investment needs to be justified particularly by demonstrating that companies are actually benefiting from the investment. It is also vitally important that the knowledge gained on construction projects is captured and shared for continuous improvement to avoid ‘re-inventing the wheel’ and to prevent repetition of previous mistakes. This is particularly useful for construction companies that undertake PFI (Private Finance Initiative) projects where they are responsible for maintenance of the building for a long period of time. By using a practical case study, this paper examines how one of the largest privately owned European companies provides information & knowledge to their employees, what their employees feel about the system and if the company is getting maximum return for their investment.

Keywords Case study, Information Technology, Information Management, Intranet Systems, PFI projects.

1. INTRODUCTION

The information and knowledge provided by the sponsoring company and other external sources through their Intranet system are often lost in pages of text, and is difficult to access in a user friendly and rational manner. The user normally requires training and long periods of time to search through the database to find any relevant information that could be of use. Often due to the volume of work that the staff has to deal with and because of the time it takes to retrieve the information they need from the system they simply give up. At best this may lead to making unqualified decisions that may not provide the best solution and at worst may lead to making entirely the wrong decision potentially costing the company a great deal of time and money to rectify.

Within the research work presented in this paper, the author has conducted a number of interviews focussing on the use of IT within the sponsoring company. The literature survey (see section 5- Literature Review) And the authors’ extensive experience in the construction industry suggest that it is unusual to come across any contractor that can present knowledge gained from previous contracts and useful information in a
comprehensible, structured and user friendly manner not only as a record that can be accessed in future but also as a benchmark to be used in forthcoming projects.

Despite 21st century technology, a great deal of time is wasted trying to find information, because of the various systems and techniques. The user has to be highly trained and/or spend a lot of time to stand any chance of finding the expected results. Jim Carty (2005) observes “A major overlooked cause of many IT project issues is that the technology tool set is not the correct one for that particular project. However, many IT professionals valiantly try to make it work since management likes the economics of using what you already have. Yet, ultimate success often depends on knowing when it's time to stop and re-evaluate the technology direction before its too late.”

This paper continues on section 2 by stating its aims and objectives, it will then briefly explains the methodology in section 3 followed by presenting a case for the need for improvement in section 4 and literature review in section 5. It then proceed to present the Practical case study that will review the outcome of a survey carried out within the sponsoring company, the result presented in pie chart format in the appendix and short summary of the conclusion of the survey in section 6. Finally it will conclude by a summary of the findings in section 6, future work in section 7 and recommendation to the industry in section 8.

2. RESEARCH AIMS AND OBJECTIVES

At the time of carrying out this research Wates Construction (sponsoring company) were looking to explore the effectiveness of their information systems with the following fields of study:

- How often the information provided in their intranet is being used
- How effective it is in providing information needed by the users
- What are the strengths and weakness of the existing system
- What is the success rate in finding the information that the users need
- Which company employees are more likely to use the system
- How likely is it that the users find what they looking for on the system
- Is there a need to improve their system
- Can they develop or deploy a better system that would serve their needs better.

Taking into account all of the above, the justification for this research is the need to:

- Provide an up-to-date survey of effectiveness in dissemination of information within the company and their partners
- Give a qualified view of the effectiveness of the existing systems
- Advise in improvement of the existing system including costs and predicted benefits
3. METHODOLOGY

In the first few months of the study, the research engineer undertook a period of investigation, participation and learning in how the existing system of information retrieval, management and presentation is carried out within the company and its partners. This was achieved by:

- Adjusting into the new role as a researcher
- Learning about the company’s IT system and how it is maintained and updated
- Gaining an insight into how various information is uploaded into the system
- Understanding how company employees and their partners access the system and find the information they are looking for
- Building relationships with key personnel, particularly those who expressed their interest in the research subject.
- Informing key users of the IT systems of the researcher’s activities and asking for their active participation in the project
- Developing an understanding of who decides what information is archived and made available to the users and why.

4. THE NEED FOR IMPROVEMENT

The government, as the largest client of the construction industry, has led the drive to change. Its Construction Task Force challenged the industry to commit itself to change. Their report commonly referred to as the ‘Egan Report’, set clear targets for improvements.

“The industry must replace competitive tendering with long term relationships based on clear measurement performance in quality and efficiency... Construction companies must prepare comparative performance data and share it with clients and each other without compromising legitimate needs for confidentiality” (Egan 1998)

There are also calls from the academic profession for change, ‘Competitive pressures from within the industry as well as external political, economic and other considerations are now forcing the industry to re-examine and improve its modus operandi’ (Anumba et al. 2000).

5. LITERATURE REVIEW

Jim Carty (2005) observes, that it is difficult to find the needed technical expertise. He emphasises that it is a common symptom that sometimes has as much to do with the approach as it is to do with selection of technology. He points out that if you find your staff is short on the skills needed to meet the schedule in a timely and cost-effective way, it is possible that the wrong technology may have chosen vis-à-vis the resources. He observes “One benchmark of the right technology is that you don’t feel like the technology is a daily struggle and you have time to focus on critical success factors like maintaining your business partners active support and participation.” He goes on
to say that It is enough of a struggle just staying on top of ever changing user requirements, scope, and maintaining organisational buy-in from the sponsors and that the last thing you have time for is a struggle with the very tools you’re using to implement the system.

Karl-Erik Sveiby (1996) identified two ‘tracks’ of knowledge management:

**Management of Information** – ‘Knowledge = Objects that can be identified and handled in information systems.’

**Management of People** – ‘complex set of dynamic skills, know-how, etc., that is constantly changing.

Ann Macintosh (University of Edinburgh) has written a Position Paper on “Knowledge Asset Management”. It identifies some specific business factors, such as:

- Marketplaces are increasingly competitive and the rate of innovation is rising.
- Reductions in staffing create a need to replace informal knowledge with formal methods.
- Competitive pressures reduce the size of the work force that holds valuable business knowledge.

Hemamalini Suresh (2002) In her paper proposes that the organisations who are driven by knowledge are the ones that will succeed. She emphasises the fact that the Combination of global reach and speed compels organisations to ask themselves, “What Do we know, who knows it, what do we not know that we should know?”

Dougherty( 1999) confirms that knowledge transfer is about connection not collection, and that connection ultimately depends on choice made by individuals.

**6. CASE STUDY**

In this case study the emphases are on strengths and weaknesses of the existing information retrieval system. The major source for retrieving information is the company’s Intranet. The information and knowledge provided by the company and other external sources are often buried in pages of text, and seldom can be accessed in a rational and user friendly manner, the user normally requires training and long periods of time to search through the database to find any relevant information that could be of use.

Following an in-depth study of the current Intranet system as the point of access for provision of knowledge and information in the sponsoring company the following findings were observed:

- There seems to be no logic in where in the intranet the user should be looking for the information they require.
- The format is not user friendly and information is more likely to be achieved by luck rather than judgement.
• Although there is a vast amount of information and knowledge stored in company’s servers often the result that the search engine provides is not what the user may expect.

• The sub-sections in different folders provided within the Intranet system often don’t seem to present the user with clear and concise heading. Consequently the user need to almost open every folder to find the subject matter that they maybe interested in.

A survey was carried out to test the suitability of the existing system and how and why certain information is accessed within Wates Company and its partner’s Intranet systems. The survey included questionnaires on the company’s Intranet, the internet and the collaboration systems. A total of 36 people from different disciplines took part. The results of the survey are presented in pie chart format. The outcome is as follows:

**Fig.1-** Over 95% of employees seem to be using the company’s Intranet system on a daily bases, although about 5% of management have never used the system. A further study through one-to-one interviews was carried out with the individuals not using the system, and the results analysed and conclusion drawn in the summary section of this paper.

**Fig.2** - The pie chart indicates the excessive amount of time it takes to look for information, this seems to discourage the users in making use of the system to the extent that 8% give up trying.
What type of information do you generally look for?

- Directory: 25%
- Documents: 30%
- Procedures & Policies: 25%
- Others: 0%
- Never use it: 20%

Fig.3 - It is interesting to find that 20% of users who are part of the management team do not use their company’s Intranet and seem to rely on other sources in finding the information they seek. This was analysed further with one-to-one interviews to establish their reasons.

Is there any information you like to see included in your Intranet?

- Yes I like to see more...: 48%
- No its OK: 24%
- Too many to list: 18%
- Don’t use it: 10%

Fig.4 - In fig.4 66% of the users expressed the need to have more information on their intranet system and only 24% think that it is fine as it stands.

What way do you think the system could be made more user friendly?

- Better search engine: 73%
- Better graphics: 20%
- Quicker response: 7%
- Spoken words: 0%

Fig.5 - Gives an idea of what end users think about how the knowledge is presented,

The overwhelming majority seems to struggle in finding information on the Intranet;

- 73% would like a better search engine. Further research indicated that the search engine provided was based on alphabetic word driven search engine and not context driven hence unless the wording in the questions are exactly as presented in the specific topic is as presented in the database the result of the search returned the wrong results.
- Better graphics seems to be the next area that could be improved.
• With improved connectivity the concerns in connection problems seem to have diminished and the 7% with this problem is seen to be an acceptable number.

• Spoken words seem to have no attraction amongst the users. This may well have to do with office environment, a further study in this section could prove beneficial.

**Fig.6** - This question had a blank answer section to encourage some feedback from the participants, their views on what could be lacking in the system. The following observation can be deduced from their responses:

• Better search engine (39%) Clearly information retrieval a major problem.

• Relationship between folders (26%) – On further analysis it became apparent that there were many subfolders within folders, these were subdivided into further subfolders. There seem to be no logic to the way they have been arranged. This has caused confusion as can be seen from the pie chart.

• Easier access (18%) - This again points to the confusion caused by the way the folders were put together.

• Fewer headings (12%) - Ditto

Judging by the response to the above question it is clear that the problem lies in finding the information rather than the lack of it.

**Fig.7** - The reason for posing this question was to see if there are preferences in using a particular system and if those reasons are purely to do with the information provided or the way the system is presented.

Although it should be noted that collaborative systems are not yet widely used and the users may not have been fully conversed with different elements of these systems.
What are the main advantages in using these kind of systems?

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessibility</td>
<td>42%</td>
</tr>
<tr>
<td>Speed</td>
<td>17%</td>
</tr>
<tr>
<td>Connectivity</td>
<td>8%</td>
</tr>
<tr>
<td>Ease in dist.</td>
<td>33%</td>
</tr>
</tbody>
</table>

Fig 8 - Accessibility seem to play a large part in this question which is only to be expected, again speed although an issue does not seem to be of primary concern to the users and it is clear that the ease in information distribution plays a big part in using collaborative systems.

Do you use the web for finding information?

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Always</td>
<td>10%</td>
</tr>
<tr>
<td>Often</td>
<td>45%</td>
</tr>
<tr>
<td>Sometimes</td>
<td>42%</td>
</tr>
<tr>
<td>Never</td>
<td>3%</td>
</tr>
</tbody>
</table>

Fig.9 - This question was posed to find the users perception in inadequacy of the company’s intranet, it can be argued that if the information provided was adequate there would be less need to use the web. Again the overwhelming majority seem to be using the internet to find information, products and services.

Which search engine do you normally use?

<table>
<thead>
<tr>
<th>Engine</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Google</td>
<td>80%</td>
</tr>
<tr>
<td>Others</td>
<td>10%</td>
</tr>
<tr>
<td>MSN</td>
<td>5%</td>
</tr>
<tr>
<td>Ask</td>
<td>5%</td>
</tr>
</tbody>
</table>

Fig.10 - This question highlights the reasons for user preference in the type of search engine they prefer and the results can be analysed to identify the factors influencing their choice.

A separate study was carried out to find if the same question given to the three search engines would give similar results. The findings reinforced the idea that layout of the search engine has a lot to do with gaining confidence of people using it. The following observations were made from the result of the study:
• Google-By far has the majority, the users seem to prefer Google search engine due to its clutter free presentation and layout
• MSN- Although gives almost the same results to the question the search engine layout is cluttered and not user friendly.
• Ask- Ditto

Fig.11 - Indicate the reasons behind using a particular search engine, the three areas of concern are sound, graphics and layout. Sound do not seem to have big impact; the major factors to consider are graphics & layout. Although Graphics seem to play the bigger part.

Fig. 12 –This question indicates the success that user have in finding the information they need from the Internet query systems such as Google. From the response the success rate seems to be quite high, so connecting the company’s Intranet search engine to the search engines such as Google could be part of the solution.

7. CONCLUSIONS OF THE QUESTIONNAIRE

Results of the questionnaire can be highlighted by the following:
• Multiple information sources scattered across the companies database
• Existing system is not user friendly
• Many different user interfaces to different information sources
• Users seem to have more success in finding information on Internet than the Intranet
• Employers store a lot of documents on the system, but you can never seem to find the right files when they need them
• There is no standard method to capture and reuse knowledge

8. SUMMARY OF FINDINGS

The survey concludes that changes are required to the existing system if it is to succeed in not only providing the employees with information and knowledge that although present is too laborious, time consuming and in some cases inaccessible to find, but also the process of adding to the information and consequently knowledge should be made available to every one rather than the very few that currently control it. It has also explored the reasons for the system failure through conducting interviews and collating employees views via questionnaires. The finding of this paper has presented the sponsoring company with a business case to replace the existing system as soon as possible.

9. FUTURE WORK

There is a clear need to develop a new system of information retrieval and knowledge management that would take account of the latest advances in information technology and delivers the goals for the company to be able to compete with its rivals. To satisfy these goals one should start by looking into how human mind/brain can absorb information with minimal effort rather like writing programmes for a computer in computer language i.e. zeros and ones. It can then explore how the information can be added to the knowledge base system without the need for rewriting the software programme and by making the individual’s contribution to the system as easy and logical as possible. This can possibly be achieved through the principals of mind mapping and software’s such as Object Orientated Design.

10. RECOMMENDATION TO THE INDUSTRY

There are two main areas where this research has impact/implication on the wider construction industry. It should be noted that this research has focused on delivering the solution for the specific needs within the sponsoring company, but its findings can and should be used to assist others that may be faced with the same problems. The two areas are:

• **Simplification**- the willingness in participation through simplification and logic in other word to contribute to the knowledge because it is possible and easy. The challenge for the industry is to ensure that the people involved in a process are informed and can draw from latest technology to willingly cruise to change, not drive change through necessity, need and competition.

• **Integration**-The current structure of organisations within the construction industry has formed barriers to sharing knowledge and information because of worries about competition and rivalry, this has resulted in alienation of the
technology and progress. The continuation of fictionalisation and ‘over the wall mentality’ means that inefficiencies will remain.

11. REFERENCES

Hemamalini Suresh., (9/2002) paper published in KM magazine
Karl-Erik Sveiby, (1996), 'What is Knowledge Management?’