Knowledge Management Within a Leading Irish Construction Organisation

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Abstract: Considered to be one of the most dynamic and complex industrial environments construction is a project-based industry which is recognised as being poor at learning on a consistent basis, improving performance and is notoriously slow in adapting to progressive change. Traditionally labour-intensive organisations employing a full workforce of tradesmen and labourers, large main contractors have generally moved away from being a 'building company' towards directly employing a core professional and management team to lead teams of outsourced contractors. Two separate organisations; Engineers Ireland (EI), the country's leading professional body and the Construction Information Technology Alliance (CITA) a research partnership between industry and academia have identified KM as important to the future competitiveness of the Irish construction industry. An in-depth case study of a leading Irish construction organisation has been conducted in order to identify and evaluate current and potential approaches to managing knowledge at individual, project and organisational levels. This consisted of a combination of interviews and surveys with a broad spectrum of management and professional staff, including a director, project managers, quantity surveyors, foremen and engineers. It was found that the company are committed to the provision of life-long learning opportunities for all staff through comprehensive continuing professional development (CPD) activities, which are accredited by EI. To fulfil the KM requirement for accreditation, a lessons learned database was implemented but has not been successful as initially anticipated. The lack of a working definition of knowledge within the organisation and awareness of the importance and potential advantages of KM reflects a casual approach, and indicates the need for further exploration of knowledge and KM-related issues. The potential for aligning individual learning with wider organisational KM objectives also merits further investigation.

Keywords: Construction industry; continuing professional development; case study; lessons learned

1. Introduction

The need to consciously manage knowledge in an organisational setting is now recognised as important to improving innovation, business performance and client satisfaction. As an academic discipline, knowledge management (KM) is relatively young, with as yet, no common understanding, apart from organisations becoming 'smarter over time' (Quintas, 2005). Two of the most prominent disciplines within the KM discourse are information systems and human resource management, with an integration of these having the greatest potential for advances in the field (Jashapara, 2004).

The construction industry is a project-based industry within which individual projects are usually custom-built to client specifications (Raiden and Dainty, 2006). These projects are typically delivered by temporary project coalitions comprising designers, consultants, contractors, specialist sub-contractors and suppliers, often characterised by adversarial and litigious relationships. The industry is recognised as being poor at learning on a consistent basis and improving performance and is notoriously slow in adapting to progressive change. The project-based, fragmented and unstable nature of the industry has led to chronic knowledge loss compared with other industries (KLICON 1999).

Reporting on ongoing research into KM in construction, this paper looks at the need for KM in construction organisations; provides an overview of the Irish construction industry; identifies the research methodology; presents case study findings; a discussion of the research; and conclusions.

2. Knowledge management in construction

The need for KM is particularly relevant to the construction industry which now faces many challenges. These include economic swings, new markets emerging in the global economy, increasing competition, the impact of technology, new and increasing demands from clients, customers and society, and the requirement to maintain a highly skilled workforce at all levels (Egbu and Robinson 2005). There are two levels at which KM has been considered in construction: inter-organisational; within projects, across temporary, multi-discipline project organisations and intra-organisational; within a single firm (Kamara et al., 2002). Considering the fragmented, unstable nature of the industry, *"there may be much greater potential for use within individual companies (KLICON 1999:30)."* According to Quintas (2005) there are two potentially conflicting objectives of KM, to build knowledge bases cumulatively and to learn from past experience; and to ensure learning beyond core areas, generating the capability to assimilate new knowledge in order to be able to respond to change. Even within organisations, the project-based, short-term and task-oriented nature of construction work inhibits learning on a continuous basis (Egbu and Botterill, 2002). The failure to capture and transfer project knowledge leads to *"reinventing the wheel, which will amount to wasted activity and impaired project performance (Anumba et al., 2005)."* In a study of American contractors, Fisher et al. (1998) identified a number of other reasons for implementing KM practices as: high staff turnover leading to loss of experience; large size of organisations make sharing knowledge difficult; and departmental silos and fragmentation within the organisation. Construction organisations have garnered much attention in terms of the potential benefits of knowledge management, with little evidence of how to actually manage knowledge in practice. A lack of understanding of both knowledge and its subsequent management within the industry indicates the need for

further empirical research in the field (Robinson et al. 2005). The types of organisation which shall be given consideration in this paper are main contractors. Traditionally, these organisations were labour-intensive employing a full workforce of labourers and tradesmen to execute the construction phase of a project on a building site. Many of these companies have now moved from being a 'building company' towards directly employing a core professional and management team to lead teams of outsourced contractors. The nature of the industry requires them to establish temporary organisational structures at dispersed geographical locations, frequently at a distance from central management (Raiden and Dainty 2006).

3. The Irish construction industry

The overall output of the Irish construction industry in 2006 was €36bn, accounting for 24% of the country's GNP, with over 12% of the country's workforce directly employed, making it a key driver of Ireland's economic growth over the past decade (Davis Langdon PKS, 2006). Despite this success, the industry is facing a number of challenges: the introduction of fixed price government contracts, an increase in the number of foreign-based firms entering the market, over-reliance on the housing market and a predicted slowdown in construction output in the coming years (DKM, 2005). Documented low levels of R&D and innovation in this important industry need to be addressed through improved knowledge transfer and creative thinking (Kelly, 2005). In this context, Engineers Ireland (EI) and the Construction Information Technology Alliance (CITA) have cited the strategic importance of KM to the industry.

3.1 Engineers Ireland

The country's leading professional body represents in excess of 22,000 individual members involved in the engineering profession. Designed to support lifelong learning, they have recently introduced a continuing professional development (CPD) scheme for employers of engineers across a spectrum of industries. In order to gain accreditation, organisations must meet specifically defined criteria including: CPD policy, performance management system, recording of CPD activity, mentoring, involvement with professional institutions, KM system and management control system. At present, twelve of the leading Irish construction companies are currently engaged in the accreditation process, of which three are fully accredited.

3.2 Construction information technology alliance

The Construction IT Alliance (CITA) was formed in 2001 with the vision of harnessing the potential of information and communication technologies in the Irish construction industry, helping to redress the research and innovation deficit in the industry. KM is one of the areas that CITA has identified as being important to its activities, recently establishing a KM special interest group (SIG).

4. Methodology

The research reported in this paper forms part of a wider study investigating KM in the leading twenty Irish construction organisations as they are perceived to exert the most influence on the approach to managing construction projects and the industry in general. As part of this research, a case study methodology was adopted to identify and evaluate KM practices within PJ Hegarty & Sons (PJH), a leading Irish construction organisation. Such an approach was chosen as it seeks a range of different kinds of evidence in a case setting, which when abstracted and collated has the potential to provide the best possible range of answers (Gillham 2000, Robson, 1993). A multi-method approach to data collection was employed, comprising semi-structured interviews and self-administered questionnaires, which were conducted with a variety of individuals within the case study organisation (Robson, 1993). Furthermore, the case study is exploratory in nature, due to the lack of previous empirical research and theory on KM in construction organisations. Therefore, the representativeness of this study is not of major concern, rather the opportunity to explore the basic properties or dynamics of the organisation upon which to build further research is (Brannick and Roche, 1997). Commencing with an interview with a company director, the case study adopted an emergent design, relying on findings from each stage governing subsequent lines of enquiry.

4.1 Interview with director

In order to get a good overview of various KM-related issues, a semi-structured interview was conducted in January 2006 with one of the company's directors. This individual was selected as he is involved in the day-to-day running of construction projects, has an in-depth knowledge of the organisation and is responsible for CPD and training. Based on an initial literature review, the interview concentrated on the management of knowledge at three ontological levels; individual, project (group) and organisational (Nonaka and Takeuchi, 1995).

4.2 Staff questionnaire

During the course of the interview, a number of topics related to managing knowledge were highlighted by the director including a lessons learned database (LLDB) and knowledge-sharing seminars. Following the interview, the possibility of conducting some in-depth research with the organisation's staff emerged leading to the design of a questionnaire. Due to a number of constraining factors including the geographical dispersion of staff at various construction site locations, a self-administered questionnaire was deemed the most

appropriate data collection method. The purpose of the questionnaire was to explore the effectiveness of identified KM initiatives within the organisation. The selection of a suitable sample was based on discussions with the director and the company's human resource (HR) manager with a view to maximising the response rate (Brannick and Roche, 1997). Subsequently, the questionnaire was administered between February and April 2006, being e-mailed to 180 professional and management staff, achieving a 36% response rate.

4.3 Project team interviews

With the questionnaire completed, it was decided to undertake in-depth semi-structured interviews with a full project team based on a €70 million commercial development project in the south-east of Ireland. Conducted between May and June 2006, the interviews allowed for expansion upon issues covered in the questionnaire. The interviewees comprised thirteen professional and management staff, including a senior contracts manager, a project manager, three quantity surveyors, three engineers, four foremen and a safety officer.

5. Case study findings

With a turnover of €320 million in 2006, PJH is the sixth largest indigenous building contractor in Ireland. Directly employing over 700 staff, the company has a head office in Dublin, with regional offices in Cork, Limerick and Galway. In 2004 PJH became the first construction company in Ireland to gain accreditation from Engineers Ireland for their Continuing Professional Development (CPD) practices. The company's primary activity is undertaking large and complex construction projects in the commercial, industrial and civil engineering sectors. PJH are becoming increasingly involved in challenging and complex, knowledge-intensive procurement routes such as management contracting, design and build, joint ventures, public private partnerships as well as the traditional procurement route. At any one time, PJH can have a considerable portfolio of projects underway of varying value, type, and complexity throughout the island of Ireland.

5.1 Individual knowledge

Apart from on-the-job experience, the main way PJH develop individual employee's knowledge is through an extensive CPD programme, which is designed in line with Engineers Ireland accreditation scheme. CPD and training, mentoring, and performance appraisals can all contribute to the enhancement of an individual's knowledge and their work performance.

5.1.1 CPD and training

The overwhelming consensus among interviewees was that PJH are excellent in their provision of CPD and training. According to a project manager who has been with the company for 10 years: *"I think they're good, they've a good attitude to staff, they support training, they support career development, so I think that overall, they're a good company to work with."* Indeed all respondents to the survey cited that a good training and development programme was either very important or important in motivating them in their work. Some staff went as far as saying that the focus on CPD and Engineers Ireland Accredited company status was a motivating factor in joining the company, particularly graduates who felt a structured programme is important for development.

5.1.2 Mentoring

Mentoring is well recognised as an effective method of transferring knowledge and experience from senior to junior employees. According to the director: *"it took us a while to get the mentoring going, because people didn't really understand what mentoring was all about, but we actually did some training of the senior people on mentoring through Engineers Ireland, and that helped, so it's actually working a lot better now."* During the course of the interviews, some of the people who were mentees, were unsure about how the process was to be approached. In one instance, the mentor and mentee were on the same site, which resulted in a less than ideal situation, and was viewed as diminishing the value of the mentoring scheme.

5.1.3 Performance appraisals

The use of an appraisal allows individuals to both assess and review performance and training and development needs for the previous and coming year. PJH try to encourage a proactive approach to appraisals, once a year each staff member is appraised by their immediate supervisor, followed by a review meeting with a company director. Areas where training is required are identified, which is reviewed at the appraisal the following year to ensure that goals have been achieved. They were identified as being beneficial to people who are career-oriented: "if I'm honest the performance appraisals are very good for people that want to move up or gain more knowledge."

5.2 Project knowledge

5.2.1 Lessons learned database

As part of the criteria for CPD accreditation, PJH implemented a lessons learned database (LLDB) to capture experience from projects and share it throughout the wider organisation. The LLDB comprises a series of

word files with hypertext links, accessible throughout the organisation on the company's computer network. Lessons are collected at post-project review meetings where key members of the project team discuss the best and worst experiences. Following this meeting, the lessons are documented in a standard template detailing the title, description and contact details for the individuals involved, and is classified based on the trade/subcontract package with which it is associated (for example cladding, glazing, foundations etc.). The lessons are then posted on the LLDB where people are supposed to refer to them when a new subcontract package commences on their project. According to the director, *"before you start that package you log onto the database and have a look and say "yeah, I know that one, I know that one, oh, there's a new one, I'll read that" and hope you don't make the same mistake again. So the theory is good but you are depending on people to take the time to look at it."* The use of the LLDB is not monitored by management, nor is it a procedural requirement of staff to check the database.

In the questionnaire staff were queried on their frequency of use of the lessons learned database (LLDB) during the course of their work. Despite nearly three-quarters of the respondents (73.8%) stating that they found it beneficial to them in their work, 36.9% of respondents stated that they used it "very rarely" with a further 16.9% having never used it. During the interviews, the use of the database was discussed from a number of perspectives, the following being the most pertinent points made:

- **Lack of time:** many respondents stated that they just didn't have the time to look through the database every time a new package started. *"I haven't checked it in about a year…you don't get time to, unless you're sitting here twiddling your thumbs…it's extremely difficult."*

- **Relevance to their current role:** some people questioned the actual relevance of the lessons learned to them in their current position; *"a lot of the things on the lessons learned are relevant to foreman level…they're the guys out there dealing with those issues…that's where the breakdown is, the people who really need to know are not accessible to a computer, its not in their job description."*

- **No requirement to contribute:** many people stated that there was no requirement on them to contribute to the LLDB, and as a result, didn't bother. *"Perhaps contributing to the lessons learned should be part of your work…the company I worked for in England did that, when you did your monthly report for the directors, you had to do your lessons learned."*

- **Difficulty finding the most recent lessons:** In terms of finding the most recent lessons, 41.8% of survey respondents stated that the LLDB was not up to-date and 32.7% identified it as difficult to search. One interviewee commented *"you have to sift through the older lessons as well."*

5.2.2 Site visits

Visiting other construction sites is seen as an important part of knowledge management, allowing participants to share knowledge and experience. The company encourages staff to visit other PJH sites to share experiences, albeit on an ad-hoc basis. The survey found that 49% of respondents had visited another PJH site to look at a specific construction method. During the interviews, it emerged that a number of participants had visited another site to look at new construction methods, *"we visited a site to look at pods and a twin wall system…we got to know how they worked, it's helped shorten the learning curve."*

5.3 Organisational knowledge

5.3.1 Knowledge sharing forum

The opportunity to meet with peers and share experiences is an important part of managing knowledge in organisations. Unfortunately, the nature of construction makes it *"difficult to get away from sites and you can't really have more than one or two people from a site going to something, that's difficult."* Just over half of the survey respondents (51%) indicated that they meet with their peers on a regular basis; in fact 40% of such responses stated that they meet with others in similar positions on a monthly basis. Of the 51%, 97% found such interaction of benefit to them in their work, particularly in discussing recurring problems, new construction methods and other issues. These views were confirmed during the course of the interviews, being viewed as *"extremely beneficial."* Of the survey respondents who didn't get to interact with others outside of their day-to-day roles, 83% indicated that they would like to do so. In general, the idea of annual meetings for the various disciplines was viewed as potentially useful but would have to be very structured.

5.3.2 Knowledge sharing seminars

PJH organise staff seminars quite frequently covering a wide range of topics, *"particularly technical, we find it's actually quite hard to get good technical courses, so we do a lot of that in-house, with our own senior managers."* All interviewees spoke of how they were actively encouraged to attend relevant seminars, attendance being driven by self-motivation. 79.2% of survey respondents indicated that the seminars helped them improve in their own work. Both the survey and the interviews revealed that discussion and interaction at the seminars is somewhat limited, being *"like a lecture."* According to one interviewee *"the seminars are effective if they get people at similar levels together, when they wouldn't normally get together and they give people a chance to learn from the experience of others."* A number of other problems with the seminars were identified as:

- **Timing of seminars:** the seminars are generally run in the evening, after a *"hard day's work on-site."* Many of the interviewees cited fatigue and long travelling times as being counter-productive to getting any value out of the seminars.

- **Delivery:** in some instances the experience of the individual in a particular area was brought into question *"the likes of the office people would be giving a seminar on lessons learned…they talk about them, but because they're not involved on site, they don't come up with any solutions."*

- **Relevance:** it is important that seminars are pitched at the right level to the audience *"if it's not relevant or you know it already, you're going to switch off."*

- **Experience of recent graduates:** timing of seminars in relation to graduates is particularly important: *"once you've seen it been done [formwork, concrete etc.] I find it's easier to go to a seminar and talk about it…it's hard to visualise something that you've never seen or experienced when you go into a room and listen to someone talk about it for an hour."*

The harsh realities of working on a construction site were also raised as one foreman stated "we were out working in the rain one day, pouring concrete, slogging away, and then I'm into this thing at 5.30…and I mean the heat and all, I'd been out in the fresh air all day, out in the wind, and I come into this nice, cosy, comfortable room to a guy in a shirt and tie…and I'm gone!" A possible solution to this problem was raised by the project manager who suggested that "there should be more done on-site, particularly on a big site like this where you have a lot of staff…it's not a thing that has to happen in head office."

5.3.3 Identification of expertise within PJ Hegarty

Throughout the course of working, people may encounter issues that they haven't dealt with previously. In these instances there is often someone within the organisation who can offer assistance, having encountered such issues themselves. An important aspect of KM is the identification of "know-who," that is, knowing the people in the organisation with certain domain expertise. In this regard, the survey asked respondents to identify the ease with which they were able to identify such people within the company. Both *"in own workplace"* and *"in head office"* ranked quite highly (89% and 67% respectively) indicating the ease with which they could identify people in these instances. Interestingly, only 46% of respondents indicated that they could easily identify expertise on other sites within the company, which may be influenced by the amount of time they are with the company. Only 16% of respondents felt that they could locate expertise in the company's other regional offices in Cork, Limerick and Galway. These figures were reinforced by interviewees, with many individuals having little or no knowledge of other construction projects or regions.

6. Discussion

Based on the case study findings, this section aims to highlight the main issues related to PJH's approach to KM, with a view to identifying how they and other construction companies can improve their KM practices.

6.1 Individual knowledge

Apart from on-the-job experience, PJH aim to support the development of individual knowledge through a number of CPD-related activities such as training, mentoring, performance appraisals and membership of professional institutions. In an industry characterised by workforce mobility and high staff turnover, these provisions are viewed by staff as important incentives to join and remain with the company.

6.2 Project knowledge

The need to capture and share knowledge from both current and past projects has the potential to improve project performance within the organisation. The implementation of the LLDB has gone some way to capturing the experience, both good and bad, of individual projects. It would appear that a distribution gap exists, which Weber and Aha (2002: 292) refer to as *"the difficulty of transmitting lessons between a lessons learned repository and its prospective user."* This can occur for a number of reasons: distribution is not part of organisational processes, users may not know or be reminded of the repository, users may not have the time or skill to retrieve and interpret textual lessons, and subsequently apply the lessons successfully (Weber and Aha, 2002). In order to improve the delivery of lessons learned to the appropriate people, these issue need to be addressed. The use of site visits as a means of sharing knowledge between live projects appears to have potential for further exploration, particularly as it is presently undertaken on an ad-hoc basis.

6.3 Organisational knowledge

The size of the organisation and geographical dispersion of sites and offices hinders opportunities for the sharing of knowledge. PJH endeavour to facilitate interaction between staff from different locations which has proven to be beneficial to those involved. Aside from formal meetings, the company organise seminars which allow staff to share technical knowledge. The timing and location of these seminars have proved problematic for site-based staff that may have to travel long distances after a hard days work on-site. The ability of staff to identify expertise within the organisation is very much limited to their current project and within the head office. The potential identification of people with specific experiences and knowledge on other projects or in other regions could enhance the delivery of projects.

7. Conclusions

The KM practices of a leading Irish construction organisation have been identified and evaluated, with a view to making recommendations for other construction firms considering implementing KM. These practices were investigated in relation to the management of knowledge at individual, project and organisational levels. Based on this investigation, the following conclusions can be made:

- The project-based, unstable nature of the construction industry poses significant challenges to the adoption of KM. Geographical dispersion of temporary construction sites, time pressures high staff turnover and internal fragmentation within organisations all contribute to these challenges.

- Considered to be a the most important part of economic growth, the Irish construction industry faces many challenges. The strategic importance of KM to the continued success of the industry has been highlighted by a number of key stakeholders.

- As part of Engineers Ireland CPD accreditation scheme, PJH have attempted to address the need to manage knowledge, closely aligned with other CPD activities. This has led to a win-win situation with individual career development objectives being closely aligned to KM.

- The use of a lessons learned database for project knowledge has not proved as successful as anticipated. In order to improve its effectiveness, use of the database needs to be made part of organisational procedures and measured and made easy to use for all levels of staff.

- There is a need for improvement in two potentially conflicting areas: the development of more knowledge sharing initiatives focused on specific construction sites and the provision of structured opportunities to visit other sites.

- It appears that the intricacies of knowledge and KM are not fully understood within PJH. This would seem to indicate the need for further exploration of these issues by the company's senior management.

While KM practices have the potential to improve the performance of construction organisations, there has been little documented evidence of such improvements in practice. This paper has identified and evaluated KM practices within a leading Irish construction organisation, highlighting a number of issues in relation to its implementation that may well be of benefit to other construction organisations in Ireland and overseas. It is now intended to progress the wider research study to explore the integration of CPD and HR issues with technology through collaborative research with CITA, EI and a number of the leading Irish construction companies.

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