A Theoretical Framework on Managing Tacit Knowledge for Enhancing Performance in the Construction Industry

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The concept of the knowledge worker and their tacit knowledge still lacks sufficient attention within construction industry, despite the fact that proper understanding and management of this resource is of immense importance for the achievement of better organisational performance. Hence this paper presents a conceptual framework for managing construction tacit knowledge, based on a review of literature and pilot interview findings. This paper stresses the importance of the construction knowledge worker and tacit knowledge, whilst highlighting the prevailing gap due to the lack of attention and recognition given to tacit knowledge in the construction industry. The necessity for purposeful, formal and systematic knowledge management (KM) techniques with a proper plan that can be monitored, controlled and measured is highlighted from the interview findings. Also stressed by respondents is the importance of measuring effort, outcomes and different areas of KM. The model will provide a valid basis and a systematic approach to manage tacit knowledge for construction organisations.

Keywords: construction industry, knowledge worker, organisational performance, tacit knowledge.

BACKGROUND

There are two ways of viewing Knowledge Management (KM). One focuses primarily on people and developing ways in which they can exchange their tacit knowledge; the other puts more weight on Information Technology (IT), using computers and software to capture and share explicit knowledge. Empson (2001) identified these two perspectives respectively as 'knowing as a process' and 'knowledge as an asset'. When knowledge is seen as an 'asset', codification strategies through person-to-document approaches are considered, whilst when knowledge is seen as a 'process', personalised strategies through person-to-person approaches are considered. Nevertheless, it is increasingly being acknowledged that KM can bring about the much needed performance improvements that construction organisations require (Egbu *et al.*, 1999; Carrillo *et al.*, 2000; Kamara *et al.*, 2003); hence different knowledge-based solutions have been proposed in construction. As the construction industry is centred upon the tacit knowledge and experience of construction workers, the industry is biased towards the process-based view of knowledge. Therefore the process-based solutions which enhance personalisation strategies and interactions between construction workers to generate and share construction knowledge, would be much more relevant to overcome KM problems in construction. Yet all too often KM is limited to the appropriation and exploitation of explicit knowledge within construction (Pathirage *et al.*, 2005a), and it is evident from existing KM work in the construction industry that tacit knowledge is either ignored or given less importance.

As such, the research work on which this paper is based, aims to fulfill this prevailing gap by introducing a theoretical framework for managing tacit knowledge to enhance performance in construction organisations. The paper is broadly divided into four sections. Initially, it outlines the current status of the KM practices within construction through a critical literature review and synthesis. Secondly, the paper explores the focus of the research which highlights the importance of knowledge workers and their tacit knowledge within the construction industry. The major findings of the pilot interviews carried out are presented in the third section of the paper, which discusses different facets of KM in construction. Finally, the paper introduces the theoretical framework for managing tacit knowledge, based on the findings from the literature and pilot interviews.

KNOWLEDGE MANAGEMENT IN CONSTRUCTION

It is argued (Egbu *et al.,* 1999; Carrillo *et al.,* 2000; Kamara *et al.,* 2003) that the main drivers behind the increased interest in KM amongst organisations operating in the UK construction industry are the government's prerequisites to achieve industry-wide improvements and the desire of individual organisations to seek competitive advantage. As Carrillo *et al.* (2000) assert, the term 'Knowledge Management' is relatively new to construction organisations. Nevertheless, a growing number of organisations within the construction industry (Kamara *et al.*, 2003) perceive KM to be an integral part of their competitive strategies for providing long-term benefits. Managing knowledge more effectively offers construction organisations a possible mechanism for improving their performance in times of greater competition, and its role as a source of competitive advantage for construction organisations has been addressed by several authors (for example, see Kululanga *et al.*, 1999; Egbu, 1999; Carrillo, 2000). However, as argued by Robinson *et al.* (2001) and Carrillo (2004), despite the interest and effort put into KM by many leading companies, the discipline is still in its infancy in the construction industry and is at an embryonic stage in UK construction.

The construction industry faces several problems in managing knowledge due to its intrinsic characteristics; it has a short-term, temporary project-based nature, with more considerable fragmentation than many other industries. Different knowledge-based solutions to overcome these problems have been proposed in construction. The asset-based solutions deploy IT systems and suggest on codification strategies. However, the use and application of these IT systems are limited in the construction industry. As Bresnen *et al.* (2003) argue, there are difficulties, challenges and limitations in attempting to capture and codify construction knowledge by using technological mechanisms, which has been further justified by several other empirical studies. Furthermore, the existing KM frameworks have mainly concentrated on the codification strategies, with a high emphasis on the role of IT (Pathirage *et al.*, 2005a). Hence this highlights the lack of recognition and concern paid to tacit knowledge and personalised strategies in existing KM work within the UK construction industry. As the construction industry is very much centred upon the tacit knowledge and experience of construction workers, the industry is biased towards the process-based view of knowledge. Nevertheless, as argued by Snowden (2002), it is important to maintain an appropriate balance between both these views.

RESEARCH FOCUS

The construction industry has already entered into a knowledge economy where it is perceived as one of the knowledge-based value creating sectors of the economy (Pathirage *et al.*, 2005b). Moreover, people are known to be the key to success in a knowledge economy and are termed 'knowledge workers'. The increased awareness of the importance of employees' knowledge coincided also with a popularisation of the

idea of the 'knowledge worker'. This is based on the notion that certain types of work are more knowledge intensive than others, and it is this knowledge intensive work that is growing within the economy (Quintas, 2005). The importance of the construction worker is highlighted by the fact that the industry relies on skill and the capacity to bring different skills together effectively (Drucker & White, 1996). Therefore the concept of the knowledge worker has long been important to construction organisations (Green *et al.*, 2004). There are a wide range of professionals involved in the construction industry, working as an inter-disciplinary team in delivering construction products. In recent years, with the growth of the service sector, this emphasis placed on the construction knowledge worker has gradually increased.

Furthermore, the tacit knowledge of construction workers has been highlighted in many research studies carried out in the construction industry. Research conducted within structural design firms (Al-Ghassani, 2003) showed that about 80% of knowledge used during the conceptual design stage is tacit compared to about 20% of explicit knowledge. According to Gann and Salter (2000), tacit knowledge is extremely important within the construction environment. For example, they state that,

although many project-based activities are increasingly organised using IT systems, there is still a need for personal contact. Tacit knowledge of individuals is essential to problem-solving in projects … It involves the individuals in the life of the project (Gann and Salter, 2000).

According to Koskinen *et al.*,

the fact that a great deal of the know-how required, for example, in an engineering project, is tied to knowledge that is not written in documents but realised through expertise and understanding of the project personnel, is not taken into consideration as a whole (2003).

Thus they suggest that reinforcing members' tacit knowledge through face-to-face interactions is of great importance. Hence the construction industry is very much centred upon the tacit knowledge and experience of construction workers, and this emphasises the process-based view of knowledge in the construction industry.

Therefore the main aim of this study is to explore and investigate tacit knowledge management in the construction industry and its relationship to organisational performance. Through the literature, the authors have established an inadequate concern for the importance and necessity of the knowledge worker and their tacit knowledge management within the construction industry. In order to further establish the importance of tacit knowledge within construction and to capture the process of managing tacit knowledge, several pilot interviews were carried out, as outlined in following few sections.

PILOT INTERVIEWS FINDINGS

The research took the view that more work needs to be done in terms of the process-based view of KM within construction, and also that the focus should be upon the knowledge worker as the prime knowledge asset as opposed to codification strategies. Therefore the pilot interviews were designed to achieve two specific objectives. Primarily they were aimed at collecting empirical evidence on the existing status of KM within the construction industry and at investigating the importance of tacit knowledge to the industry. Secondly, these interviews sought to identify any critical issues that need to be addressed within the tacit knowledge management process as identified by Pathirage *et al.* (2006). As such, three leading academics were interviewed who had

extensive knowledge and experience in the construction industry. Succeeding sections outline the main findings from these pilot interviews on the existing KM practices within construction and the issues relating to the tacit knowledge management process.

TACIT KNOWLEDGE IN CONSTRUCTION

Within literature, organisations' knowledge resources are described as an iceberg. The visible tip of the iceberg is considered as the structured explicit knowledge, whilst the invisible, momentous part beneath the surface represents the tacit knowledge. All the interviewees agreed that the codification is the differentiating aspect between explicit and tacit knowledge, although it is a complex issue. In general, explicit knowledge was defined as the knowledge which is easily codifiable, transferable and also exploitable. Tacit knowledge was described as the knowledge that resides within the 'knower' - i.e. the person - which is very sticky and messy, problematic to codify, transfer and share, and also difficult to exploit; this is attributable to the person's experience, exposure and context. Furthermore, interviewees agreed that the terminologies 'explicit' and 'tacit' are the ends of the spectrum. In addition, one interviewee highlighted a term of increasing interest – 'implicit' knowledge. As the interviewee explained:

"there is something call implicit knowledge and implicit knowledge is something that is within somebody and the person may not know, but when the trigger is right, the person somehow consciously uses that".

In contrast, in literature, tacit knowledge is further divided into two components: knowingly technical and cognitive. The technical component is referred to as implicit knowledge, which is codifiable. This was clarified by the interviewee as the difference in the school of thought and the paradigm, i.e. the psychological or economic paradigm, and whether knowledge is considered as a stock or a flow. As further explained by the interviewee "the notion of truism is not something we are dealing with here". In the context of construction, examples of tacit knowledge include estimating and tendering skills acquired over time through hands-on experience in preparing bids, understanding the construction process, interaction with clients/customers and project team members in the construction supply chain, as well as understanding tender markets. Moreover, interviewees agreed that workers will fall back on experiences, friendship and collaboration when faced with real complex projects, as they are the first to know that IT is not working.

All three interviewees recognised the importance of tacit knowledge within the construction industry, and also the fact that it is not fully exploited by the industry. They considered tacit knowledge as the key to the performance of the industry. As one of the interviewees highlighted:

"…if one tries to find out the types of knowledge that contributes more to innovation and competitiveness, it is the tacit knowledge as opposed to the explicit knowledge. So there is a need to say tacit knowledge as important and there is even more need to explore that fully because we still haven't learnt how this sticky knowledge works, especially when you look at knowledge as a stock or a flow across chains, supply chain and networks, intra and inter…".

Furthermore, respondents admitted that most of the KM initiatives within construction have looked into explicit knowledge, whilst the necessity is for the tacit knowledge. They reasoned that this was due to several reasons, but mainly the fact that the origin of modern KM issues has been driven by a technocrat approach, hence driven by IT. Thus KM has been considered as a mere extension of data management, information

management, knowledge-based systems and so forth, and this legacy is still in existence. In providing further insights on this, one interviewee cited the fact that

"there is a good reason to suggest that explicit types of knowledge lend themselves more readily to the use of IT and exploitation of IT than the tacit form of knowledge and also due to the simple reason that, explicit knowledge is more codifiable, you can feel it, you can hold it and you can mess around with it".

However, one interviewee stressed the necessity to look into the wider picture, although agreeing that it is driven by IT. In summary, interviewees outlined different categorizations of knowledge, also admitting the importance of tacit knowledge and the fact that existing KM work in construction is driven by IT.

TACIT KNOWLEDGE MANAGEMENT AND TECHNIQUES

Tacit knowledge management could be described, in general, as the process of generating, sharing and utilising knowledge which resides within human beings to enhance learning and performance within an organisation. Yet as the literature reveals, there are major problems associated with the adoption of tacit knowledge management in construction, particularly in the formulation and implementation of the initiatives. The problem for many organisations stems not only from the concept of KM or the complexity of operationalising it, but also from the fact that the implementation of KM initiatives has often been ad hoc with a high degree of fragmentation and lack of co- ordination. Providing further insights, respondents agreed that every organisation practices KM in one form or the other, either with or without the explicit realisation that they are doing so, as there is a need to do something with the knowledge they have. But the major problem perceived by the respondents is that many organisations do not have a formal, structured way of managing their knowledge assets. As one respondent stated,

"the case is not whether organisations manage tacit knowledge, the case is whether they know that they manage it effectively and whether they have formal and structured way of dealing with it".

As such, interviewees felt that many organisations have techniques pertaining to KM, yet management intervention in terms of implementing them in a structured and purposeful way seems to be lacking.

In literature, 'KM tools' refer to both IT and non-IT tools that support the processes of KM, such as locating, disseminating and sharing knowledge, although the term is too often used narrowly to mean IT tools. Often, to distinguish between KM tools, the terms 'KM techniques' and 'KM technologies' are used to represent 'non-IT tools' and 'IT tools' respectively. KM techniques, mainly used for managing tacit knowledge, do not depend on IT, although this does provide support in some cases. Interviewees referred to examples of KM techniques, i.e. tacit knowledge practices, as being communities of practices, story telling, use of action learning, use of mentoring, brainstorming, coaching, job rotation, quality circles and so forth. All three respondents agreed that these techniques are in existence within construction organisations in the occurrence of meetings, brainstorming exercises, coaching, job rotation and employee exchange - where workers from one department go to another department with the view of acquiring knowledge and go back to their own department to share it. However, the absence of a formal and a structured way of managing these techniques was highlighted as the major drawback within the industry. One interviewee stressed that construction organisations are implementing these KM initiatives, although it is open to debate whether they implement them 'properly'. Hence the respondent took the view

that for many organisations, 'properly implemented' knowledge practices do not really take place. The respondent asserted that for a proper implementation,

"you need to think about it, you need to have objectives, you need to have a business case and then you implement it and don't leave it at this stage and see whether the reasons why you implemented them have been achieved".

Supporting the same view, another interviewee argued that,

"the question is do they do that purposefully in such a way that they know the aim of those things that they know the benefits they can bring, that they know they are exploiting it to the fullest and they have the way of measuring how well they are doing it".

However, one interviewee stressed the importance of examining these techniques in detail in order to distil out carefully, by looking into different groups and teams, how they deal with these techniques, rather than considering an organisation as a single unit. In summary, the necessity to have purposeful, formal and systematic KM techniques with a proper plan that can be monitored, controlled and measured was highlighted by all three interviewees.

MEASURING PERFORMANCE

As identified in literature, the determination and establishment of the impact of KM initiatives on organisational performance are of utmost importance for an organisation to justify their implementation. Nevertheless, problems in measuring the contribution of knowledge to business performance have been cited frequently in KM literature, which has resulted in few KM texts making an explicit connection between KM and organisational performance. All the interviewees, while admitting the difficulty in doing so, felt it necessary to judge the performance of KM initiatives due to several reasons. As argued by one interviewee, since profit-making organisations work on the premise that one unit of input requires more than one unit of output, it makes sense for organisations involved in KM to see how the effort they put into the processes or techniques of KM yields dividends. Therefore measuring the outcomes of KM initiatives is considered to be important in making value judgments on their contribution to the business performance. One interviewee asserted that it is necessary to measure both effort (input) and outcomes (output), as companies too often measure outcomes only. The effort is concerned with finding out whether the knowledge is good quality and up-to-date, and more importantly the interviewee highlighted the necessity to measure the performance of the conversion process: "…is it best exploited by storey telling, by the use of brainstorming sessions, through communities of practice…". One interviewee disagreed on the term 'measuring KM practices', as it implies one simple thing measured in the same way. The respondent rather argued for different units of measurement for different areas of KM, like knowledge generation, capturing, sharing, and transferring:

"we need to be very critical and to go deeper….when you are measuring you are not measuring one thing, you are measuring individual things and your measures can be quantitative or it just can be subjective measures".

This in a way reflects the discussions in the literature on KM measurement, which argue that both knowledge asset (stock) and the KM programme (flow) need to be measured. When questioned on the usage of existing measurement KM frameworks on KM within the industry, it was revealed that only a few, if any organisations implement sophisticated measurement frameworks; instead, organisations are using their own

ways of measuring outcomes. The large amount of time and training required to learn measurement systems, alongside the extensive investments needed are cited as the reasons preventing organisations from using sophisticated measurement frameworks. In summary, interviewees admitted the necessity to measure performance of KM initiatives, but also the inherent difficulties of doing so. Furthermore, the importance of measuring effort, outcomes and different areas of KM were stressed by the respondents.

THEORETICAL FRAMEWORK

The interview findings stressed the need for a formal, systematic and structured way of managing tacit knowledge. Hence, based on the theoretical understanding gained from the literature and the issues revealed from the interview findings, a conceptual model (see Figure 1) was devised which graphically represents the process of managing tacit knowledge in construction. The core of the model represents the tacit knowledge generation process, i.e. the cognitive process within human beings. This generation process and the utilisation of the tacit knowledge are influenced by several internal and external factors, as represented in the four levels. Internal factors are at the individual level, which influence the generation process and the utilisation of tacit knowledge. External factors will be at the group, organisational and industry level. These factors, in terms of four layers, are denoted within the model by use of a dotted triangular which also shows the direction of impact. Tacit knowledge needs to be shared and disseminated, through interaction by use of KM techniques like communities of practices, brain storming sessions and action learning which is represented at the group level. Hence tacit knowledge management strategy needs to address factors which influence both the tacit knowledge generation and utilisation (asset view), and the group level techniques (process view). Outcomes of this process are linked with performance at the organisational level and in achieving competitive advantage which is at the industry level. Finally, this total process of tacit knowledge management is reflected in five maturity levels, which indicate the stepwise progress to achieving sustainable competitive advantage within the industry.
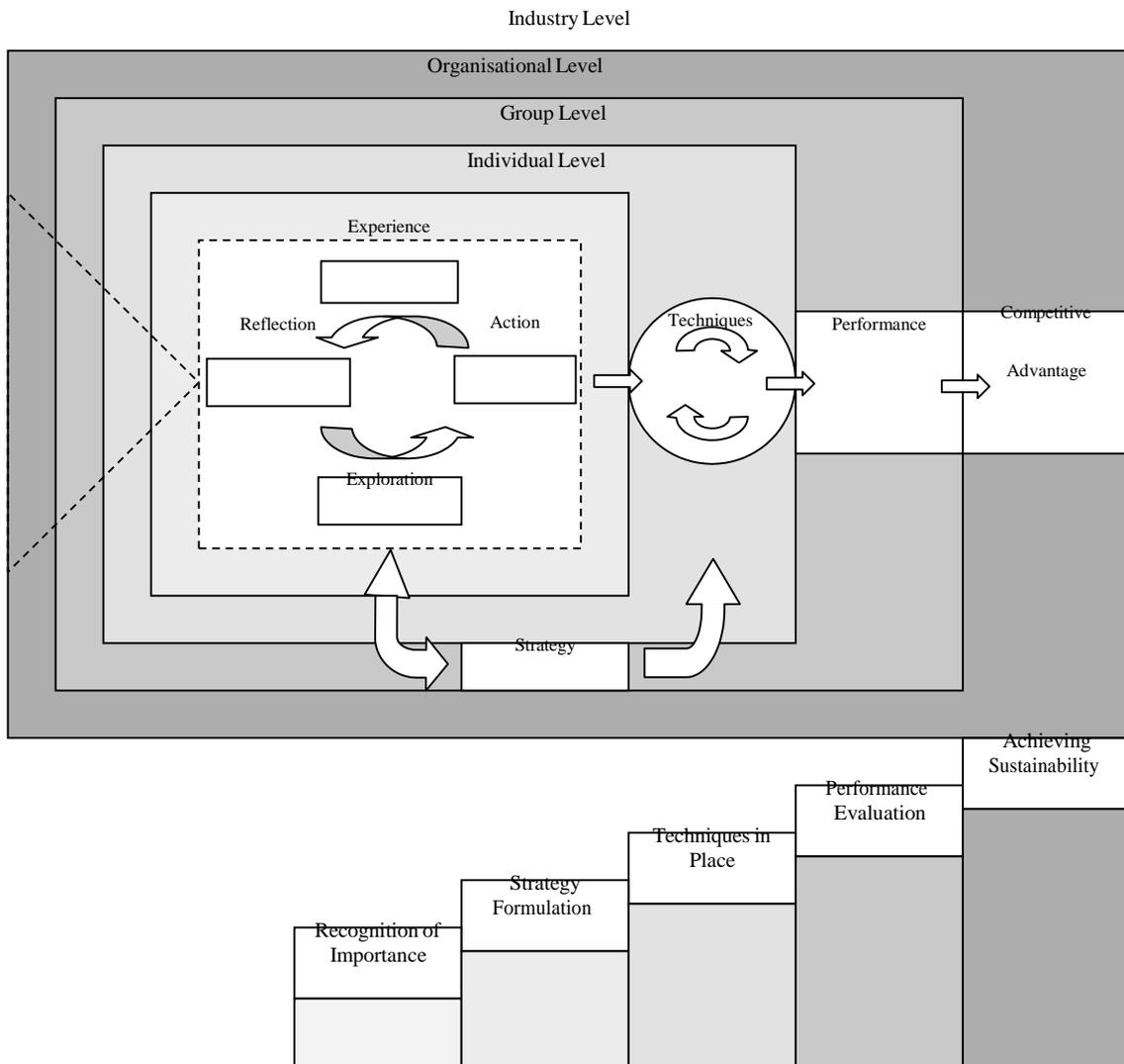
Fig. 1: Tacit knowledge management model.

The first stage of the maturity levels establishes an understanding of the importance and necessity, and an awareness of the benefits of tacit knowledge management within an organisation. This will articulate a valid business case to manage tacit knowledge in construction organisations. The second stage of the maturity levels illustrates a two-fold tacit knowledge management strategy which establishes a proper plan for the implementation and measurement stages. Once the strategy of tacit knowledge management is established, appropriate KM techniques need to be implemented to achieve the perceived goals in a structured and a coordinated manner, as highlighted in the third stage of the maturity model. Once KM techniques are in place, appropriate performance measures need to be utilised to evaluate the benefits and outcomes of both knowledge assets and KM techniques. Once this process of tacit knowledge management becomes institutionalised, it will be embedded within the day-to-day routine tasks of employees and the culture of the organisation, which will facilitate achieving sustainability. This is illustrated in the stage five of the maturity model.

THE WAY FORWARD

The initial literature review revealed a lack of concern for the knowledge worker and their tacit knowledge within the construction industry. Hence, the research took the view that more work needs to be done in terms of the process-based view of KM within construction, and that there needs to be a structured way of dealing with construction tacit knowledge. These affirmations were further strengthened by the outcomes from the pilot interviews, which also provided some insights on issues to be addressed within the tacit knowledge management process. Based on both literature and interview understanding, the theoretical framework for managing tacit knowledge was devised which highlighted a stepwise approach to achieving better performance for construction organisations. This model will be refined and validated by means of a few expert opinions to capture the industry requirements, and through an action research phase within a case study approach.

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