MANAGING THE CONSTRUCTION WORKER IN A KNOWLEDGE ENVIRONMENT

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Abstract: Valuable human and knowledge resources will be wasted unless organisations make better use of these prime resources. Construction knowledge workers and their tacit knowledge in particular is still considered to be relatively unexplored and proper understanding and management of this resource is of immense importance for better organisational performance. The paper stresses the importance of knowledge worker and tacit knowledge in construction and examines the contribution towards the company performance. Two dimensions in construction knowledge worker management are highlighted. This provides a valid basis to embrace the concept of knowledge worker and a knowledge culture at all levels within construction organisations.

Keywords: construction industry, human resource management, knowledge worker, tacit knowledge.

1. INTRODUCTION

As highlighted through number of government and academic reports (Latham, 1994; Egan, 1998, Fairclough, 2002), the construction industry is a sector of the economy which faces many challenges, especially in terms of performance. Yet, with the shift of businesses from an asset-centric to a knowledge-centric environment, it is increasingly being acknowledged that Knowledge Management (KM) can bring about the much needed innovation and improved performance the construction industry requires (Webb, 1998; Egbu et al, 1999, Carrillo et al, 2000; Kamara et al, 2003). Against this background of the knowledge economy, what people do with their knowledge, termed as tacit knowledge, is considered to be the real driver for the performance of the industry. Therefore, as a labour intensive industry, the construction worker and their tacit knowledge has become more relevant to sustaining business performance than traditional physical capital (Drucker, 1993; Scarbrough & Swan, 1999), and is considered as a critical factor in determining a construction organisation's ability to remain competitive.

The importance of the construction worker and their tacit knowledge is highlighted through the industry's reliance on skill and the capacity to bring different skills together effectively (Drucker & White, 1996). Accordingly, the concept of the knowledge worker has long been important to construction organisations (Green et al, 2004). Further, due to the intrinsic characteristics of the industry, construction employs an extremely diverse range of people from a wide range of occupational cultures and backgrounds, including unskilled people, managerial and professional positions, and carries the challenge in managing people effectively to ensure organisational success. Moreover, the construction industry has gained a reputation for the dominant culture of command and control which emphasise and correlate with the hard model of human

resources management. In this context and in order for the construction industry to achieve best value, there is an emerging importance placed on effectively managing the knowledge worker and their tacit knowledge.

Accordingly, this paper aims to highlight the importance and the relevance of the concept of knowledge worker and their tacit knowledge in order to enhance the performance of construction organisations, through a critical and comprehensive literature review and synthesis. The paper is organised into five broad sections: the first section explores the knowledge intensive nature of the construction industry whilst the section two outlines the growing concept of knowledge worker in construction. In sections three and four the importance and the relevance of tacit knowledge in construction and its relationship to the performance are critically analysed respectively. Finally a case is made for the need to value and manage the knowledge workers and their knowledge in the construction industry,

2. CONSTRUCTION AS A KNOWLEDGE BASED INDUSTRY

There has been a surge of interest in managing knowledge during last few decades, leading to considerable changes in the business environment. Hence, knowledge management is now seen as the greatest value of creation for businesses, which has resulted in the move from an asset-centric to a knowledge-centric business environment. In the UK Government's Competitiveness White Paper, *Our competitive Future: Building the Knowledge Driven Economy*, a 'knowledge economy' was defined as one in which the generation and the exploitation of knowledge have come to play a predominant part in the creation of wealth (DTI, 1998). Against this background of knowledge economy, the subject of managing knowledge is increasingly being viewed as of critical importance for organisations wishing to retain competitive and achieve excellence in service delivery. It is argued (Robertson et al, 2001: Egbu & Robinson, 2005) that the construction industry, although known for its highly tangible products such as buildings and other structures, is increasingly now recognised as a provider of services, placing more emphasis on knowledge. Further, the UK Government's Competitiveness White Paper (DTI, 1998), refers to a more effective use and exploitation of all types of knowledge, particularly in the traditional construction industry in order to give the UK a competitive edge.

Construction is an industry which utilises a variety of separate firms in a temporary multidisciplinary organisation, to produce investment goods like buildings, roads, bridges etc, which are custom built to unique requirements. The industry is generally driven by single and unique projects, each creating and disbanding project teams made up of varying combinations of large and small firms from across the supply chain spectrum (Tatum, 1986; Carty, 1995; Halpin and Woodhead, 1998). The short-term temporary project based nature is considered as an intrinsic characteristic of construction and industry is considerably more fragmented than many other industries with a much greater concentration of small firms (Green et al, 2004). The industry is heterogeneous and diverse, consisting of different organisations, consultants, building materials and product producers, and professionals providing a range of services for client, customers and the wider community. The scale of small firm activity in the UK construction industry is considerable, with, in 2003, 98.2% of UK construction firms having 1-59 staff (Department of Trade and Industry, 2004: Table 3.1) and delivering

some 45% of the industry's workload (Department of Trade and Industry, 2004: Table 3.3) and accounting for 122,220 small and medium construction firms in 2003 (Green et al, 2004).

Despite the very high levels of service-input needed from these small and medium construction firms in the formation of construction products, too often, the industry is known for its products and not seen as an industry that provides services to its clients and customers. Nevertheless, the number of professional service firms within construction industry too has risen from 48,202 in 1995 to 52,490 in 1998 (CIB W55-W56, 2002) and the services offered by these professional service firms are characterised by being highly knowledge intensive in nature (Løwendahl, 2000) where knowledge has more importance than other inputs. Research conducted by Windrum et al (1997) and Den Hertog and Bilderbeek (1998) identified design, architecture, surveying and other construction services as knowledge intensive service sectors. This in a way evident the shift towards the knowledge economy in UK construction industry and there is significant agreement that the principle means by which this growing body of professional service firms creates value through the successful management of knowledge (Robertson et al, 2001). Further, the issues of knowledge production, transmission and transfer are considered to be important facets of the knowledge economy (Egbu & Robinson, 2005). Research carried out by Management of Knowledge and Innovation Research Unit (Egbu et al, 2003) has empirically established these aspects of the knowledge economy in construction industry. In this context, construction industry is perceived as a knowledge based value creating sector of the economy. Moreover, people are known to be the key to success in a knowledge economy, whom termed as knowledge workers. There are a wide range of professionals involved in construction industry, working as an inter-disciplinary team in delivering the construction products. In this context, the succeeding section explores in detail the construction worker in a knowledge environment.

3. KNOWLEDGE WORKER IN CONSTRUCTION INDUSTRY

People are recognised as possessing knowledge and know-how, having the ability to create knowledge and value, and collectively retaining organisational memory. What people do with their knowledge is the real driver for competitive advantage in the knowledge economy (Quintas, 2005). As highlighted by the UK Government's Competitiveness White Paper (DTI, 1998), one of the two distinct tasks envisaged for organisations within the knowledge driven economy is to encourage and support employees in developing their skills and qualifications on a continuous basis. The UK construction industry employed 19,130 workers per £1 billion output (total of 1,599,000 workers) in 2003 (Green et al, 2004), hence considered to be one of the labour intensive sectors of the economy. Construction companies frequently claim that 'people as their greatest asset' (Carrillo et al, 2000) in a situation where literature on human resource management repeatedly emphasises the need to treat people as a key resource. People are an organisation's most valuable asset and this is especially true in relatively low-tech, labour intensive industries such as construction (Green et al, 2004).

The rediscovery 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 industry relies on skill and on the capacity to bring different skills together effectively (Drucker & White, 1996), thereby the concept of the knowledge worker has long been important to construction organisations (Green et al, 2004). In recent years, with the growth of the service sector, this emphasis placed on the construction knowledge worker has gradually increased. However, knowledge worker and their knowledge also represent the most difficult resource for organisations to manage. As an intrinsic characteristic of the industry, construction employs extremely diverse range of people from a wide range of occupational cultures and backgrounds, including people in unskilled, craft, managerial and professional positions, challenging to manage knowledge worker effectively to ensure organisational success. Further, much of this individual knowledge is unknown to others and unmapped and unrecorded. As Sheehan et al (2005) asserts in construction;

- Some 80% of the useful knowledge is tacit and cannot be written down
- The construction industry is characterised by a wealth of experiential knowledge, yet employees retire or leave the organisation, potentially taking tacit knowledge and a potential source of competitive advantage with them

As Rezgui (2001) cited, there are few key reasons that limit current approaches of KM in the construction industry. Among the key factors for these limitations are;

- Much construction knowledge, by necessity, resides in the minds of the individual working within the domain.
- The intent behind the decisions is often not recorded or documented.
- The individuals who have knowledge about the project are likely to left for another project at the end of the construction stage; hence their input is not captured.

All these three limitations indicate the direct correlation with the human factor in the construction industry and stress the importance of the concept of knowledge worker which has long been central to construction industry performance. Further, both Sheehan et al (2005) and Rezgui (2001) stress the point that much knowledge possessed by knowledge workers being tacit in nature particularly in construction industry. Accordingly, the following section outlines the nature of the tacit knowledge and its presence in construction as a knowledge based industry.

4. TACIT KNOWLEDGE IN CONSTRUCTION

Within the last few decades, there has been an increasing interest in the tacit dimension of knowledge, which is perhaps hardest to manage, as it cannot be formally communicated and is often embedded within human beings. As Herrgard (2000) suggests, tacit knowledge is obtained by internal individual processes like experience, reflection, internalisation or individual talents. Individuals are the primary repositories of tacit knowledge that due to its transparent characteristics is difficult to communicate and therefore cannot be managed and taught in the same manner as explicit knowledge. While highlighting the importance of tacit knowledge, Tiwana (2000) defines it as know-how that is stored in people's heads which is personal, acquired mainly through

education, training and experience. In a similar sense, Saint-Onge (1996) describes tacit knowledge as an individual's intuition, beliefs, assumptions and values, formed as a result of experience. It is from these beliefs and assumptions, which make up an individual mindset that decisions are made and patterns of behaviour developed. Thereby, in working life one can easily find many examples of tacit knowledge such as intuition, rule-of-thumb, gut feeling and personal skills, all based on individual experiences. When synthesised, tacit knowledge could be classified into two dimensions knowingly the technical and the cognitive dimension (Herrgard, 2000, Hussi, 2004). The technical dimension encompasses information and expertise in relation to 'know-how' and the cognitive dimension consists of mental models, beliefs and values (Gore and Gore, 1999), in short conception of reality. As such, some forms of human knowledge can be communicated to others through language or symbols, however, the cognitive dimension of human knowledge cannot be communicated in language or symbol.

Within construction, the type of knowledge varies considerably, yet gains increase concern on tacit knowledge as a labour intensive industry. In the context of construction, examples of tacit knowledge include estimating and tendering skills acquired over time through hands-on experience of 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 (Egbu & Robinson, 2005). Specially, Engineers, Architects and other professionals within the construction industry are not in a position to 'cut and paste' best practice (Kamara et al, 2003) from the past due to the unique and the complex nature of the construction projects. They have to draw on the past to find solutions for the future. Tacit knowledge evolves from these shared practices and experience which need to be managed for the project and the organisational success. According to Wetherill et al (2002), knowledge in construction domain can be classified into three categories as illustrated in Table 1, which further highlights the emphasis placed on knowledge worker and tacit knowledge.

Table 1: Classification of Knowledge in construction domain (Wetherill et al, 2002)

Domain Knowledge	the information available to all companies and is partly stored in electronic data bases
Organisational Knowledge	company specific and intellectual capital of the firm which also comprises knowledge about the personal skills, project experiences of the employees
Project knowledge	which includes both project records and the recorded and unrecorded, memory of processes, problems and solutions

Above classification reflects the organisational hierarchy and when one moves from domain knowledge to project knowledge the concentration on knowledge too moves from explicit to tacit nature. By taking a different stance Stahle (1999) suggests organisations into three-dimensional system i.e. mechanistic, organic and dynamic nature, depending on the different challenges presented for management of knowledge. Mechanistic part deals more with explicit knowledge whilst organic nature helps the organisation to work flexibly with a people-centred orientation and involves the management of tacit knowledge. The dynamic nature facilitates continuous improvement and innovation. Wetherill et. al's classification reflects the organisational

hierarchy and when one moves from domain knowledge to project knowledge the concentration on knowledge too moves from explicit to tacit nature, which further highlights the knowledge worker concept in construction. Stahle's suggestion indicates both the management and the production of the knowledge. In a similar sense Moodley et. al (2001) contends that the tacit knowledge is developed through the individual or project teams, while the explicit knowledge is created through process, procedures and other routines that can be codified. What ever the classification, tacit knowledge of the workers has been clearly highlighted in many research carried out in the construction industry. A research carried out within structural design firms (Al-Ghassani, 2003) showed that about 80% of knowledge used during concept design stage is tacit compared to about 20% of explicit knowledge. As such, managing tacit knowledge more effectively offers construction organisations a possible mechanism for improving their performance in times of greater competition. This stresses the importance of tacit knowledge in construction and succeeding section explores the possible relationship to performance when tacit knowledge is managed effectively.

5. STRATEGIC IMPORTANCE OF TACIT KNOWLEDGE

Researchers investigating on the sources of organisation's sustained superior performance have primarily and typically anchored their work in the Resource Based View (RBV) of the organisation (Barney, 1991; Wernerfelt, 1995; Peteraf, 1993). The RBV considers two assumptions in analysing sources of superior performance and competitive advantage. First, it assumes that firms within an industry may be heterogeneous with respect to the resources they control. Second, these resources may not be perfectly mobile across firms, and thus heterogeneity can be long lasting. One of the principle insights of this view is that not all resources are of equal importance or posses the potential to be a source of superior performance through resource heterogeneity and immobility. As Barney (1991) contended, it is the possession of key resources or strategic resources and its effective deployment in product-markets that render superior performance for organisations. To be a key resource or a strategic resource it should possess four attributes:

- It must be valuable: to exploit opportunities and/ or to neutralise threats in a firm's environment
- It must be rare: among a firm's current and potential competition
- It must be imperfectly imitable, and
- There can't be strategically equivalent substitutes for this resource that are valuable but either rare or imperfectly imitable.

These attributes of organisational resources can be thought of as empirical indicators of how heterogeneity and immobility a firm's resources are and thus how useful these are for generating superior performance through sustained competitive advantage. For many authors (Amit & Schoemaker, 1993; Grant, 1996; Krogh & Roos, 1996; Spender, 1996; Teece, 2000; Eisenhardt and Santos, 2000) knowledge, which possesses all these characteristics of a strategic asset, is the best and the only resource for achieving sustainable superior performance as postulates in the Knowledge Based View (KBV) of the firm. This perspective considers knowledge as the most strategically significant resource of the firm (Grant, 1996), and its proponents argue that heterogeneous

knowledge bases and capabilities among firms are the main determinants of sustained competitive advantage and superior corporate performance (Decarolis and Deeds, 1999; Winter and Szulanski, 1999).

Yet, the increasing dynamism of the environment, with its frequent and rapid changes in technology, customer preferences, and competition, has led a number of researchers (e.g., Eisenhardt, 1989; D'Aveni, 1994) to question the sustainability of superior performance of any given strategic position, bundle of resources or set of moves. As Eisenhardt and Santos (2000) argued, in high-velocity environments, an extreme form of dynamic markets where even basic industry characteristics such as boundaries, competitors and customers are in flux, no specific advantages are sustainable. Therefore, the dynamic capabilities approach argues that competitive advantage is dependent on particular organisational and managerial processes, termed 'dynamic capabilities', which are defined as the firm's ability to integrate, build and reconfigure internal and external competencies to address rapidly changing environments (Teece et al, 1997).

Based on this understanding of organisations and dynamic environment, Grant (1996) proposed a knowledge-based theory of strategy. As Grant (1996) asserts, the source of competitive advantage in dynamic environments is not knowledge that is proprietary to the organisation, because the value of such knowledge erodes quickly due to obsolescence and imitation. Rather, sustained superior performance is determined by non-proprietary knowledge in the form of tacit individual knowledge. Tacit knowledge can form the basis of competitive advantage because it is both unique and relatively immobile. The distinction between tacit and explicit knowledge has proven to be particularly important in this dominant view, which identifies tacit knowledge as the most significant strategic resource of firms. Yet, because that knowledge is possessed by individuals and not the organisation, a critical element of sustained competitive advantage is the ability to integrate the specialised and tacit knowledge of individuals. As such, this highlights the importance of tacit knowledge towards organisational performance when integrated and managed properly. Having established the importance of the knowledge worker, tacit knowledge and it relationship to the performance, following section discusses further the management of knowledge worker and tacit knowledge.

6. DISCUSSION

KM is increasingly recognised as an integrated concept relating to the 'active management of intellectual assets, either in the form of explicit knowledge held in artefacts or as tacit knowledge possessed by individuals or communities' (Snowden, 1997). Nevertheless, as Harman and Brelade (2000) contended, KM to be effective, must encapsulate the idea that it is through the acquisition of knowledge by individuals and their willingness to apply their knowledge for the benefit of the organisation that competitive advantage is achieved. Davenport (1998) further highlights this issue by asserting "the most dramatic improvements in KM capability in the next ten years will be human and managerial". Invariably, the management of tacit knowledge is intrinsically linked to the management of people (Egbu et al., 2001) and to the processes that facilitate knowledge generation, distribution and sharing between related individuals and workgroups. This stresses two aspects or dimensions in tacit knowledge

management i.e. the management of people or the knowledge workers with the right human resource policies and to ensure knowledge supportive and conducive environment or culture within the organisation.

As already discussed, a knowledge worker has traditionally been seen as a highly skilled, highly paid specialist. An increase number of individuals do work which is knowledge based and the concept of knowledge worker needs to embrace these individuals who can be found at the all levels within organisations (Harman and Brelade, 2000). A major aspect of managing tacit knowledge in a knowledge-based economy is giving to knowledge worker the power that arises from the ability to solve the critical contingencies facing the organisation. It means that knowledge worker will increasingly be able to determine that they are managed in ways acceptable to them. As suggested by Tyson (1995), for managers this will involve a paradigm shift to see themselves as facilitators rather than controllers. This highlights the necessity of managing knowledge worker with flexible, employee centred approaches based on consensual models (Harman and Brelade, 2000). Yet, Construction as an industry which has a reputation for its dominant culture of command and controls consistently emphasises and correlates with the hard model of human resource management. Also the culture of subcontracting and self employment marginalises the importance of people management and thereby reflects and reinforces the dominant industry receipt of hard human resource management. Soft human resource management policies based on empowerment and commitment are much more prevalent within organisations orientated towards creativity (Green et al, 2004). This is true when it comes to the professional service firms within the construction industry, who compete successfully internationally by investing heavily in knowledge based services. As such it is an urgent matter for the construction industry to move towards the softer approach based teamwork from hard model of human resource management to enhance the collective efforts.

The ignorance of the knowledge worker within the construction context has contributed to a great extent for the under performance of the industry as lamented by many authors. As Egan (1998) asserted;

"….*much of construction does not yet recognise that its people are its greatest asset and treat them as such. Too much talent is simply wasted, particularly through failure to recognise the significant contribution …… We understand the difficulties posed by the fragmented structure of the industry, but construction cannot afford not to get the best from the people ……*" (para 17: 14).

As contended by Nesan & Holt (1999), the issue of the critical role that employees play in fostering an effective construction business (appropriately referred to as the "people" factor) has often been overlooked. According to Cooke-Davies (2001: 185), "*it is people who deliver the projects and not processes and systems*", which gains increased validity in the context of construction, as a labour intensive industry.

As the second dimension, the KM environment needs to reinforce the acquisition, use and sharing of individual tacit knowledge. Therefore, significant effort should be directed towards exploiting non-IT techniques such as communities of practice to facilitate person-to-person and person-to-organisation interactions (Robinson et al, 2001). Communities of practice within which individuals share common work

experiences and problem agendas provide a social context within which knowledge may be created and effectively shared. Several authors (for Eg, Augier and Vendelo, 1999; Koskinen, 2003), have repeatedly highlighted the importance of interaction, integration and involvement of knowledge workers through social networking within an organisation. Social interaction of employees cultivates a knowledge sharing culture based on shared interest, thus encouraging continuous knowledge generation through the evolution of a community of practice. Within the community of practice, tacit knowledge may be shared in non-codified forms (Brown & Duguid, 1998). According to Koskinen (2003), in such kind of knowledge environment manager could support the acquisition and sharing of knowledge and expertise by;

- Encouraging individuals to use their knowledge and expertise
- Facilitating innovation and creativity and encourage new ideas
- Representing the interests of the individual/ team to the organisation

This will involve an understanding of individuals and teams and a willingness to be open to new ideas and personal development. As such managing tacit knowledge in a knowledge environment, corporately through human resource policies and procedures will be judged by its ability to encourage and enable knowledge workers to apply their knowledge for the benefit of the organisation.

7. CONCLUSION

The advent of knowledge based economy requires a broader understanding of knowledge management and the concept of a knowledge worker. The construction is a knowledge based industry, where knowledge has become the driving force to bring critical competitive advantage. For the construction industry to perform successfully with the challenges of the knowledge economy it has to embrace the concept of knowledge worker and a knowledge culture at all levels within organisations. The paper stressed the importance of knowledge worker and tacit knowledge in construction, examined the contribution towards the company performance and the management of knowledge worker. This provides a valid basis for more empirical studies centred on knowledge worker and their tacit knowledge in the construction industry.

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