Knowledge Utilization in Construction Projects: A Conceptual Framework

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ABSTRACT

Knowledge management processes are important to achieve better performance and development in organizations. The purpose of this paper is to highlight the role of knowledge utilization in enhancing project performance. A conceptual framework of knowledge utilization was developed through the review of relevant literature. The framework regards knowledge utilization as a linear process that starts with knowledge acquisition followed by knowledge conversion, which involves knowledge sharing, generation, and integration. When resolving issues or making decisions in construction project sites, a new knowledge is generated and utilized through knowledge conversion process. The connection between knowledge utilization and project performance is shown in the proposed framework. This framework is useful to determine some issues frequently appear in construction projects such as project delay.

Keywords: construction site issues, knowledge management strategies, project performance.

I INTRODUCTION

Knowledge management attempts to create value from knowledge and information, which has been captured, shared, stored and disseminated in organizations. Hansen et al. (1991) define knowledge management as a conscious practice implemented to create value from intellectual assets via employment of either codification strategy or personalisation strategy. Similarly, knowledge management is also defined as an approach to create value via optimisation of intellectual assets in order to gain and sustain competitive advantage, involving activities such as knowledge capturing, consolidation, dissemination and reuse (Carillo, Anumba, & Kamara, 2000). These definitions show the benefits of knowledge management including creating value and achieving continuous development in organizations.

Yet, numerous studies continue to report knowledge management as a promising strategy to be adopted to increase organisations’ competitive advantage (Berawi, 2004; Ribeiro, 2009; Waddell & Stewart, 2008). The positive effects of knowledge management to organizational long-term goals make it a seemingly perfect solution to different challenges embedded in the construction industry.

Construction industry is driven by a high usage of knowledge derived from a pool of professionals from various disciplines (Egbu & Robinson, 2008; Ribeiro, 2009). According to Loosemore (1994), problems are unavoidable during construction stage because of the unpredictable on-site construction environment. Serenatne and Sexton (2009) describe ‘construction problem-solving’ as a ‘knowledge-intensive activity’ indicating significant knowledge utilisation by project team members when resolving issues or innovating problem solutions. Problem solving also appears to be the identical basis that catalyses various knowledge modes in the knowledge creation processes model by Fong (2003). This illustrates strong link between knowledge utilisation and the management of on-site related problems, such as coping with project time overrun.

Competition in the construction sector is mainly driven by pursuit of efficiencies rather than innovation (Nielsen & and Michailova, 2007). Knowledge management in the construction industry is, therefore, focused on improving efficiency in project delivery, such as increasing capability to innovate, improving business performance and satisfying clients’ needs (Kamara, et al., 2002). However, most of the available knowledge management literatures are focused on the process of managing and utilising knowledge within both project settings and organisational settings (Carillo, et al., 2000; Fong, 2003). Limited studies are found to establish the relationship between knowledge management and project performance outcomes. This study attempts to fill this gap and simultaneously gain further understanding on the reality of knowledge utilisation in construction projects context. Therefore, the objectives of this paper are to explore the process of knowledge utilisation and highlight its influence on construction projects performance. The outcome of this paper is a conceptual framework of knowledge management that highlights the importance of knowledge utilization in this context. Next section provides a review of knowledge management strategies and knowledge utilization.

II KNOWLEDGE MANAGEMENT STRATEGIES

A. Codification Approach

Hansen et al. (1991) describe codified strategy as ‘people-to-document’ approach; where tacit knowledge is translated into explicit form (e.g. document, flowchart) which allows for storage and dissemination. The main purpose of this strategy is to collect, codify and distribute information (Lierni & Ribiere, 2008). This approach is particularly suitable to the ‘reuse economic model’, where the main target of knowledge management is to attain large revenue.
through massive usage of knowledge asset (Hansen, et al., 1991).

Codification mechanism allows knowledge to be codified and stored in databases and documents, which enables easy access by employees within the company (Boh, 2007; Tang, Zhao, Austin, Darlington, & Culley, 2010). This approach relies heavily on the usage of information technology (IT) (Lierni & Ribiere, 2008). The reduction of communication costs due to knowledge reuse and the upsurge of IT advancement make codification strategy a cheaper approach to be employed in various organisations (Boh, 2007; Hansen, et al., 1991).

However, codification mechanism is found to restrict communication medium to a certain degree, thus limiting the richness of knowledge shared between people (Boh, 2007). In the construction industry, codified knowledge is reported to be transferred via usage of social networks with IT-based platforms such as communities of practice or discussion boards (Tang, et al., 2010). However, due to the slow uptake of IT within the construction sector, IT is found to be used as a one-way communication media to share simple information across all functional units in construction industry (Egan, 1998; Nielsen & and Michailova, 2007). Therefore, it is predicted that the implication of codification approach is less significant in the management of on-site issues within the construction sector.

B. Personalisation Approach

Contrary to the codification approach, personalisation involves activities such as sharing and transferring of knowledge from one person to another through process of socialisation (Hansen, et al., 1991; Tang, et al., 2010). The main purpose of this strategy is to enable tacit knowledge to be shared amongst people in a certain context (Boh, 2007; Lierni & Ribiere, 2008). This mechanism depends on expertise knowledge offered by small teams and suitable for businesses which provide customised solution to their clients (Hansen, et al., 1991).

Personalisation strategy provides a rich medium for communication as it uses people as media for sharing knowledge (Boh, 2007). It relies on the ‘expert economics’ logic, where the focus of businesses is to maintain high profit margins by providing customised solution to unique problems to relevant clients (Hansen, et al., 1991). The shared tacit knowledge will become the mental property of others (Tang, et al., 2010). This mechanism has the inherent flexibility to transmit tacit knowledge via discussions and shared interpretations, which is consequent to the development of new knowledge (Boh, 2007).

Empirical findings from various studies to date suggests that the construction industry adopts more of personalisation approach when managing its organisational knowledge, project knowledge and inter-project knowledge (Carillo & Chinowsky, 2006; Chen & Mohamed, 2010; Kamara, et al., 2002; Mohamed & Anumba, 2006; Seneratne & Sexton, 2009). The role of people-centric knowledge management approach in helping construction organisations to realise their long term-term vision is also emphasised by Chen and Mohamed (2010). Thus, the personalisation approach may have a significant influence on site-related problems.

III KNOWLEDGE UTILIZATION

Knowledge is said to be utilised if it is applied in real-life situations (Gold, Malhotra, & and Segars, 2001). For example, expert knowledge from various project team members is used when developing innovative solutions to manage on-site problems (Charoenngam & Masqood, 2001; Chen & Mohamed, 2010; Egbu, 2004). Knowledge utilisation is also perceived to hold a learning component and overlap with knowledge development process (Kalling, 2003). Utilisation of tacit and explicit knowledge by means of knowledge management tools and techniques are observed to be significant to the improvement of project management in various industries (Lierni, 2004).

Knowledge utilisation is vital in the management of projects as it relates with performance improvement, increased productivity and capability enhancement. Chen and Mohamed (2010) claimed that knowledge utilisation could lead to the production of output which contributes to significant impact on business performance. Davenport and Klahr (1998) stated that knowledge utilisation could improve companies’ efficiency and reduce their costs. Knowledge utilisation is observed to result in modified and improved activities, like improving efficiency when performing tasks (Kalling, 2003). In construction sector, Chen and Mohamed (2010) affirmed that knowledge utilisation is significant to organisational business performance improvement, achieved through higher organisational productivity resulting of construction techniques enhancement and project cost reduction.

IV IMPORTANCE OF KNOWLEDGE UTILIZATION IN CONSTRUCTION PROJECTS

Problems are bound to arise during construction phase and must be resolved before it affects the project schedule (Charoenngam & Masqood, 2001). Services obstruction, poor site communication, incomplete design, local resident and cooperation issues are some of the on-site problems reported to hamper the construction site performance and thus lead to project extension of time (Othman, Torrance, & Hamid, 2006; Mohamed & Anumba, 2006). Decision and problem solution must be made in timely manner in order to avoid adverse effect on the project’s construction-time performance (Teerajetgul & Charoenngam, 2006). Empirical findings of some studies indicate that application of knowledge could result in improved efficiency and performance in both organisational and project contexts (Chen & Mohamed, 2010; Gold, et al., 2001).

The significance of knowledge utilisation in construction industry is revealed in the dynamic usage of tacit knowledge when solving various emerging on-site problems (Teerajetgul & Charoenngam, 2006; 2008). In addition, the ability of individuals and the whole project team to utilise knowledge is reported to be imperative to ensure project success (Teerajetgul, et al., 2009). Lessons learned from past solutions and experiences are examples of tacit knowledge utilised by site managers to improve site management in construction projects (Mohamed & Anumba, 2006). Previous experience and judgements are
utilised to assist problem solving in construction projects (Charoenngam & Masgood, 2001; Fong & Choi, 2009).

Utilisation of tacit knowledge in construction organizations mainly involves the application of conventional approaches such as face-to-face discussions and informal meetings (Mohamed & Anumba, 2006; Teerajetgul & Charoenngam, 2006; 2008). These techniques are perceived to be the common approaches adopted in construction companies as means to share and transmit tacit knowledge (Fong, 2008; Ribeiro, 2009). Besides, site meeting is another technique, which can also be utilised as a delay mitigation procedure when managing construction projects (Abdul-Rahman, Berawi, Berawi, Mohamed, Othman, & Yahya, 2006). Conventional techniques are suitable to be applied in construction projects parallel to the major usage of tacit knowledge in this sector, which mainly resides in the minds of construction’s professional workers (Chen & Mohamed, 2010; Mohamed & Anumba, 2006).

V FRAMEWORK OF KNOWLEDGE UTILIZATION

A. Acquisition
Knowledge can only be utilised if it is successfully acquired and shared between individuals in a particular context (Liebowitz & Megbolugbe, 2003). Knowledge acquisition is found to underlay most of the knowledge creation processes within the construction industry (Chen & Mohamed, 2007; Teerajetgul & Charoenngam, 2008). Chen and Mohamed (2007) define knowledge acquisition as: “seeking and acquiring knowledge from external environment and creating new knowledge based on existing knowledge within the organisation” (p.246).

Fong and Choi (2009) identify two main sources of knowledge acquisition: a) external sources, and b) internal sources. Knowledge can be acquired internally through post project review, job rotation and lessons learned after project closure (Fong & Choi, 2009). On the other hand, knowledge can be acquired externally through recruitment of experienced staff or forming collaboration between individuals and business partners (Fong & Choi, 2009; Gold, et al., 2001).

Knowledge in construction projects can be acquired either in the form of tacit (e.g. experience, judgement) or codified knowledge (e.g. drawings, specification). Construction knowledge such as these can either be acquired within the project team context (e.g. from consultant or contractor) or outside the project team context (e.g. refer problem to external experts) (Fong, 2003).

B. Conversion
In construction projects, knowledge is observed to be mainly utilised by team members when developing solutions to the problems that arise on-site (Teerajetgul & Charoenngam, 2008). Tacit and explicit knowledge from various disciplines in a construction project team is fused and converted into ‘new knowledge’, which can also be viewed as on-site problem resolution in form of ‘new solution’ or ‘decision’.

Gold et al. (2001) claims, that knowledge must be converted into a useful form to ensure effective application. Knowledge conversion processes are typically presented in the form of interrelated knowledge activities that contribute to the creation of new knowledge (Chen & Mohamed, 2010; Fong, 2003; Kasvi, Vartiainen, & Hailikari, 2003). Similarly, Fong (2003) proposed that knowledge conversion process during the management of construction’s time-related problems includes these activities: (a) knowledge sharing, (b) knowledge generation, and (c) knowledge integration. The following section further discusses the significance of these activities in knowledge conversion process when developing problem solution for construction issues.

C. Sharing
Sharing of tacit knowledge is viewed as fundamental in the problem solving activity within the construction project (Teerajetgul & Charoenngam, 2008). Knowledge sharing within construction project team is influenced by socialisation processes including openness of team members, motivation, trust and time-pressure (Fong, 2008). Socialisation in construction site happens when team members gather to discuss and share experiences with the aim of defining problems and formulating solutions to these problems (Teerajetgul & Charoenngam, 2006). The shared knowledge is then converted into new knowledge, which is subsequently applied to projects in the form of innovation or decision (Liebowitz & Megbolugbe, 2003; Teerajetgul & Charoenngam, 2008).

D. Generation
Emergent knowledge is described as novel, original and ‘fresh’ knowledge, created via group discussion and active interaction between project team members (Fong, 2003). Project decision or solution, which is made based on previous judgement or experience, is not categorised as ‘emergent knowledge’ created through the process of knowledge generation. Emergent knowledge is observed to be usually produced in the form of creative project solution or innovation (Fong, 2003; Teerajetgul & Charoenngam, 2008). Innovation is synonymously viewed as creativity and is defined as a product of idea exploitation (Egbu, 2004). The generated knowledge will only emerge after the project team goes through the process of socialisation. Based on this, it can be assumed that knowledge sharing is a prerequisite process prior to knowledge generation process in the knowledge conversion cycle.

E. Integration
Knowledge that is shared or generated can be integrated to produce solution or decision to resolve on-site project issues. Knowledge integration is defined as a marrying of diverse perspectives and knowledge from various disciplines during the project decision-making process (Fong, 2003). Teerajetgul and Charoenngam (2006) on the other hand describe that the ‘integration’ process incorporates the amalgamation of both cognitive and technical element when developing creative decision making. Existing tacit and explicit knowledge that was shared during socialisation will be combined to complete the knowledge conversion process. Empirical results indicate that this process is employed by Thai construction managers in making decisions by connecting discrete elements of explicit knowledge into a set of more complex and systematic knowledge (Teerajetgul & Charoenngam, 2006).
F. Competence

Many literatures reported that competency plays an important role to induce creative decision-making and problem-solving process during the implementation of construction projects (Charoenngam & Masqood, 2001; Teerajetgul & Charoenngam, 2006; Teerajetgul, et al., 2009). Competency is defined as the skills required for construction managers to be knowledgeable and adaptable in any situation and when carrying out a given task (Teerajetgul & Charoenngam, 2006; Teerajetgul, 2009). The need to acquire competent workforce equipped with required technical and managerial skills is acknowledged in the construction sector (Egan, 1998). Knowledge such as engineering and technical skills is found to be highly utilised in construction projects (Mohamed & Anumba, 2006).

The importance of having experienced construction managers and skilled labourers is viewed as an approach to resolve delay problems in construction projects (Abdul-Rahman, et al., 2006). Othman et al. (2006) also suggest for the competency level of site personnel to be improved so that civil engineering projects in Malaysia can be completed on time. Therefore, this study assumes that competence plays an influencing role to induce the knowledge utilization process.

G. Utilization

According to Gold (2001), effective utilization of knowledge is generally presumed to be achieved once knowledge is created. Therefore, this study presumes that new knowledge, which generated as a response to decision made or problem solved, is an important component for knowledge utilization process.

As discussed in a prior section, knowledge utilization can be defined as knowledge application on real-life situations (Chen & Mohamed, 2010; Fong & Choi, 2009; Gold, et al., 2001). Knowledge that is successfully converted is utilized or applied to enhance project performance. For example, when knowledge is utilized to manage time-related issues during the execution stage of a construction project, it is predicted that this utilization will show a positive impact on project’s schedule.

Figure 1 illustrates a conceptual framework of knowledge utilization and its role in resolving on-site construction problems and achieve better project performance. This is a linear cause-and-effect model, which comprises of three main components: a) input, b) process and c) output. Development or detection of on-site problems is defined as the ‘input’ component. The ‘process’ component comprises of activities relating to conversion of both new and existing data, information and knowledge.

An explanation of the processes in the framework and their sequence is shown in the previous sections (A - G). Conversion activity produces ‘new knowledge’ in form of decision or problem solution. The ‘output’ will be the impact reflected on project performance when new knowledge is utilized. Competence and skills of project managers is a moderating factor that affects the speed of knowledge conversion and the accuracy of decision and solution made.

VI CONCLUSION

This paper highlights the potential role of knowledge utilization in resolving on-site issues and its influence on project performance. The conceptual framework proposed in this study attempted to explore the main processes of knowledge utilization, including knowledge acquisition and knowledge conversion. Through the implementation of new knowledge, this study showed the importance of knowledge utilization in achieving better project outcome.

The proposed framework provides a way to explain how strategies and tools of knowledge management can be used in practice to tackle different problems in construction projects. Future research can help to determine whether knowledge utilisation will show a significant impact on resolving construction project issues. A case study approach can be useful to compare the framework with the current practice in resolving problems that require critical decision making such as time and cost overrun.
REFERENCES


