

A framework for developing construction project-based knowledge mapping



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KICEM

1. Introduction

KM is not a new concept. To be more precise, KM deals with the process of identifying, creating, codifying, classifying and using value from an organization's intangible assets. In the KM area, companies are realizing that their competitive edge is mostly the brainpower or intellectual capital of their employees and management. Many organizations are drowning in information, but starving for knowledge. In order to effectively encourage competitive edge, companies must leverage their knowledge internally and externally to survive in the dynamic knowledge economic society. Within this context, KM is believed to be the current savior of organizations and recognized as a key strategic resource to successfully implement projects and businesses. Drucker (1993), Rollet (2003) and Halawi et al. (2006), for example, emphasized the value of knowledge as an intellectual capital because knowledge is a real asset of enterprise as it is successfully identified, captured, codified, classified, transferred and used by its users within projects and organizations.

Within this context, many enterprises and organizations are increasingly having interest and concern in the potential benefits of KM, operating successful KM. It has been stressed by many

academics and practitioners that the organizations must create a knowledge sharing environment in order to effectively improve KM culture. From this perspective, many companies provide incentive to promote this climate until it becomes the norm (Egbu, 2001, Thite, 2004, Stuckenschmidt et al., 2005). Furthermore, many companies are having their technologies such as information technology (IT), KMS, K-map and KM process for effectively managing their knowledge including data and information. However, in spite of the claimed value of KM, a number of problems have been identified in practice where the problems erode the practical and potential advantages of KM in projects. Particularly, it has been emphasized by many empirical researchers and practitioners that K-maps have been promoted as a key fundamental resource and critical solution in the underdeveloped KM area (Liu and Hsu, 2004, Henao-Cálad and Arango-Fonnegra, 2007, Yun 2008). Nevertheless, K-map has not fully investigated and sought to develop. Robinson (2005), Kamara (2002) and Maqsood (2006), for example, stressed that K-maps have to be appropriately developed successful KM for organizations.

The aim of this study is to propose a relevant framework of K-map development as an approach

for construction projects. This paper is presented as follows. An appropriate literature for K-maps and construction projects is reviewed. Finding a relevant focus for construction project-based K-map development framework is argued. From this perspective, this study has taken a nested research methodology approach. An overview of the construction project-based K-map development framework is provided, which is detailed with describing each of the separate stages. Fundamental principle of K-mapping is proposed and the types of K-maps available within construction projects are investigated and described. Final, the major constraints and critical unsuccessful factors of K-map development are discussed and summarized.

2. KM and K-map in Construction projects

The construction industry is a more project-based industry compared with the other industries and is a more labor-intensive industry in which temporary project organizations are formed to plan, perform and complete projects (Loosemore et al., 2006, Raidén and Dainty, 2006). Furthermore, it has been agreed that construction project organizations which, as a learning organization, come together with its construction workers and professionals to successfully accomplish the construction project have its own capacity and knowledge in a form of people (Love et al., 2004, Maqsood et al., 2006, Raidén and Dainty, 2006).

In the KM area, it has been insisted that knowledge is generally identified, created, transferred, converted and shared in the dynamic and complex project and business contexts (Maier, 2002, Rollet, 2003, Robinson et al., 2005). Construction projects have been also performed in the dynamic and complex project-based contexts where knowledge is created, used, stored and

transferred by construction actors and its organizations (Kamara et al., 2002, Hari et al., 2005, Robinson et al., 2005, Egbu, 2006). Within this context, the construction industry has recently focused on the fact that the efficient KM leads to the creation of competitiveness and value within construction project organizations, improving project performance through skills and knowledge of organization members (Kazi, 2005, Robinson et al., 2005, Maqsood et al., 2006). From this perspective, Yun (2008) proposed four types of K-mapping in order to effectively develop K-maps appropriate to construction projects with exploring and integrating key construction project resources and technologies such as construction actors, construction processes and knowledge transfer technologies: narrow-based K-map, construction actor-based K-map, construction process-based K-map, broad-based K-map.

3. Concept of K-mapping framework

K-map is an effective process and tool to effectively manage knowledge and successfully develop KMS (Wexler, 2001, Tiwana, 2002 and Liu and Hsu, 2004). Further, it has been emphasized that the key characteristics and resources in project and organization must be considered as a critical prerequisite and component to developing a relevant project-based K-map, but they should be integrated to the K-map (Grey, 1999, White, 2002, Liu and Hsu, 2004). Kim et al. (2003), for example, argued that K-map can be created by integration of process management and contents management for effective workflow-based KM. Within this perspective, framework for K-map development has been mentioned as a necessary and successful process in the KM area.

In the construction industry, it has been insisted

that key project resources and technologies, such as construction actors, construction processes, construction equipment, construction materials and KM technologies, must be investigated as a critical component for construction project-based KM (Bhatt, 2001, Egbu, 200) and, they have been selected and integrated as a key component of K-map development for the construction project-based KM in the construction industry (Yun, 2008). This means that the key construction project resources and technologies should be used as a key input and a critical determinant to successfully develop an appropriate K-map for construction projects and organizations. Therefore, it can be said that framework of K-mapping is a critical process for a successful K-map development in construction project-based KM where the K-mapping framework will be created by correspondent different projects, depending on the key characteristics and resources of construction projects. In spite of value of K-mapping framework, no one framework for construction project-based K-mapping has been fully sought in the KM area. In this study, a framework for construction project-based K-mapping is proposed for appropriate construction project-based KM and KMS development and its key variables are discussed

and articulated, providing fundamental principle of K-map development.

4. Framework for construction project-based K-mapping

4.1 Construction project-based knowledge

All the interviewees have recognized that construction project-based knowledge is created, owned and used by construction actors and construction project organizations (team). Furthermore, it has been stressed by the interviewees that construction project-based knowledge must be created, codified, classified, stored and used with systematically mapping for effective KM. From the interviews, three types of construction project-based knowledge were provided: construction process-based knowledge, management system-based knowledge and construction technique-based knowledge. Table 1 presents a type of construction project-based knowledge derived from the interviews. Based on the insights of the interviewees, the following synthesized definition of construction project-based knowledge is proposed:

“Construction project-based knowledge is created, owned and used by construction actors and their

Table 1 Type and shape of construction project-based Knowledge

Type (Examples)	Shape		Needs
<ul style="list-style-type: none"> ▶ Construction process-based Knowledge (Project process, construction process, design process and etc.) ▶ Management system-based knowledge (Risk management, quality management, time management and etc) ▶ Construction technique-based knowledge (Piling technique, roofing technique, drawing technique, plumbing technique and etc) 	– Explicit knowledge	<ul style="list-style-type: none"> – Guide books – Procedures – Laws – Regulations – Drawings – Specifications – Hand books – Bills of quantity – Report – etc 	<ul style="list-style-type: none"> – for effective project performance – for effective project completion – for effective project-based knowledge learning – for effective KM
	– Tacit knowledge	<ul style="list-style-type: none"> – Experiences – Insights – Skills – Know-how – Techniques – Intuitions – etc 	<ul style="list-style-type: none"> – for successful KMS development

organisations which must be appropriately classified and applied according to K-map development approach strategy: project-based knowledge, process-based knowledge, management-based knowledge and construction technique-based knowledge.”

4.2 Construction project-based K-map

K-map is broadly defined as a key strategic resource for successful KM. This study is focused on developing a framework of K-mapping based on the construction projects. In the interviews, different aspects for construction project-based K-map were argued by the interviewees. Above all the things, it has been emphasized that K-map is a key and necessary process for effective KM and successful KMS. Construction project performance can be improved by the KM developed with construction project-based K-map and the capacity and skills of construction actors can be also enhanced. The synthesized definition of construction project-based K-map is as follows:

“Construction project-based K-map that is a critical process and component of KM and KMS within construction projects can improve construction project performance and staff’s capacity and skills

through learning of relevant construction project-based knowledge within a structured KM environment which promotes appropriate knowledge search, transfer, share and use.”

4.3 Key constraints to K-mapping

In the K-mapping process, investigating and analyzing key constraints of K-mapping is very important for effectively recognizing, identifying and removing the constraining forces and successfully developing an appropriate K-map in construction projects. The key constraints of construction project-based K-mapping were derived from the interviewees (Table 2).

5. Conclusion

Successful KM including KMS development is considerably related to appropriate K-mapping. This means that KM and KMS development must be based on appropriate K-map which is created with considering KM vision and strategy. This study reviewed current initiatives for K-mapping in construction project-based KM area. The key interview findings provided from a single-holistic case study at a large South Korean construction consulting firm were used to create the K-mapping

Table 2 Key constraints to construction project-based K-mapping

Area	Key constraints	
▶ Construction project	▶ Poor leadership of chief executive officer	<ul style="list-style-type: none"> – Cost for K-map development – Time for K-map development – Shortage of professional training for K-mapping – Different opinions and gaps between the key stakeholders or chief executive officer and K-map developers
	▶ Poor organization culture	<ul style="list-style-type: none"> – Inflexibility of organisation structure – Rejection of organisation members for new technologies – Poor interest and concern of organisation members – Adherence of tradition and custom
▶ KM	▶ Poor professional K-mapping training	<ul style="list-style-type: none"> – Lack of K-mapping experts – Lack of K-mapping training experts – Poor K-mapping training and system
	▶ Poor K-mapping knowledge	– Poor tools, techniques and systems for effective and successful K-mapping: knowledge visualization process; knowledge codification process; knowledge classification process; knowledge transfer process and etc
	▶ Poor K-mapping strategy	<ul style="list-style-type: none"> – Strategy for effective tacit knowledge share and transfer – Strategy for effective explicit knowledge share and transfer

framework in the construction project contexts. Various approaches to the K-mapping were also investigated and considered, and the imperatives and variables for the K-mapping within the construction projects were also discussed and embodied (construction project-based knowledge, construction project-based K-map, key constraints and principle of K-mapping) (Table 1, 2). Within this context, It has been insisted by the interviewees that K-mapping framework is necessary to successfully develop appropriate construction project-based K-map. No one K-mapping framework will be relevant into all projects. This means that K-mapping framework must be developed with considering key characteristics of construction projects. From this perspective, an appropriate K-mapping framework in this study has been proposed for effective KM and successful KMS development, analyzing the interview data, reviewing appropriate literature and company documentations. The needs of construction project-based K-mapping framework are as follows:

- need to analyze and apply KM strategy, vision and plan;
- need to collect and analyse key data such as project process-based data, project-based knowledge, task of project members, organization assigned affairs, interview data derived from project members and so on;
- need to identify and define construction project-based knowledge
- need to group and classify construction project-based knowledge
- need to select the relevant types of K-map available within construction projects; and,
- need to identify the critical paths/routes to successfully develop appropriate K-map.

5.1 Limitations of research

There are a number of limitations in this study. Above all the things, the key limitations have been derived from to the research methodology adopted for this study. This study does not have enough attempts to assess and evaluate the variables “objectively” and “quantitatively”. Nevertheless, this study provides an important underpinning for future researches on K-map map development framework within construction projects, gaining knowledge in depth. The other studies choosing complementary research methodologies which can cover in width are able to have possibilities and opportunities to improve and enhance the findings. Final, the theory developed in this study was based on investigation of an appropriate K-map development framework, conducting the case study. However, the case study is based only on a single holistic case study although the case study conducted and sufficiently provided the data and information to develop and propose the framework for successful K-map development within construction projects.

5.2 Future research issues

This study is based on the exploration of a large-sized construction consulting firm. Future studies can be performed to explore the relevance of theory in small and large-sized construction consulting firms and general contractor firms. Furthermore, the theory of this study can be also used for future researches to conduct cross-sector and cross-industry comparative studies to extend the scope of generalizability across areas and industries

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