

CRITICAL SUCCESS FACTORS FOR KNOWLEDGE MANAGEMENT STUDIES IN CONSTRUCTION

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Abstract:

Knowledge management (KM) is the organization, creation, sharing and flow of knowledge within organizations. The reuse of information and knowledge minimizes the need to refer explicitly to past projects; reduces the time and cost of solving problems, and improves the quality of solutions during the construction phase of a construction project. The knowledge can be reused and shared among the involved engineers and experts to improve the construction process and reduce the time and cost of solving problems. This paper identifies Critical Success Factors (CSFs) for implementing knowledge management in construction projects from the Taiwan perspective in particular. Through the questionnaires and interviews geared toward project participants on enterprise knowledge management experience, the opinions of various parties - general contractors and subcontractors were sought and evaluated in relation to critical success factors for knowledge management in construction phase. The relationship between the perception of knowledge management success and a set of success factors hypothesized in the study was derived using factor analysis and multiple regressions. The results indicated that certain requirements must be met for knowledge management implementation to succeed. In particular, the establishment of a reward strategy, a willingness to share knowledge, a clear definition of rules, a friendly and satisfied knowledge exchanging system, and well-function knowledge management organization were believed to be the significant underlying factors for knowledge management success. Such an identification of success factors could well formulate effective strategies for enhancing knowledge management in construction and improving project performance.

Keywords: Knowledge Management; Critical Success Factors (CSFs); Construction Projects

1. INTRODUCTION

Knowledge management (KM) is the organization, creation, sharing and flow of knowledge within organizations. Knowledge management can be in the form of idea management systems that allow employee ideas and suggestions to be captured and shared online. Many organizations are now engaged in Knowledge Management (KM) efforts in order to leverage knowledge both within their organization and externally to their stakeholders and customers [2, 3]. Knowledge is the true asset of a marketing-oriented organization, and its integration across departments and disciplines should be emphasized [1]. The reuse of information and knowledge minimizes the need to refer explicitly to past projects; reduces the time and cost of solving problems, and improves the quality of solutions during the construction phase of a construction project (see Fig. 1). If experience and knowledge are shared, then the same problems in construction projects do not need to be repeatedly solved. Reduced problem-solving has the following advantages. (1) The cost of problem solving is reduced and (2) the probability of repeat problems is decreased. Several enabling activities should be considered to help to achieve the ultimate goal of efficient experience and knowledge reuse; experience and

knowledge should be preserved and managed; that is, they should be captured, modeled, stored, retrieved, adapted, evaluated and maintained [4].

Within the architecture, engineering and construction (AEC) industry, where the need for innovation and improved business performance requires the effective deployment and utilization of project knowledge, the need for strategic knowledge management is also being acknowledged [5]. This paper reviews various initiatives for KM in order to assess the extent to which it is being implemented in the AEC sector. Contextual issues are identified, and the findings from two research projects are used to assess current strategies for KM in AEC firms. These studies show that effective knowledge management requires a combination of both mechanistic and organic approaches in an integrated approach that incorporates both technological and organizational/cultural issues [5]. In AEC industry, enterprises have been good at collecting and storing explicit information in enterprise databases, but they are not always successful at tacit knowledge retrieval and sharing [8]. A case study from the oil and gas sector is used to explore the KM activities of eight leading organizations and investigate the opportunities for construction organizations [6].

2. RESEARCH OBJECTIVES

Construction projects are characterized by their complexity, diversity and the non-standard nature of the production [11]. Whatever successful and unsuccessful projects have been executed, a valuable record of each one should be kept to identify best and worst company practices. In construction practice, one of effective means in improving construction management is to share experiences among engineers, which helps to prevent mistakes that have already been encountered in past projects. Problems that have already been solved do not need to be solved again. Furthermore, engineers and experts normally take domain knowledge with them and leave little or nothing that will benefit subsequent projects or the company when they complete projects or leave the company. From the perspective of knowledge management, this know-how and these experiences of construction engineers and experts are the most valuable because their accumulation depends not only on manpower but also on the spending of much money and time. Knowledge management in the construction phase mainly deals with the process of creating value from construction operation, organization to company knowledge. How to apply and reuse the past finished projects for future similar projects is the main issue of knowledge management in the construction phase of projects. Therefore, it is very important to identify critical success factors to construction knowledge management for the people who will apply knowledge management in the enterprises. The study seeks to find out these critical success factors according to the experience and concepts from participants. A questionnaire was developed to facilitate data collection in this study. Senior and junior engineers involving knowledge management practice in construction are invited to participate in the survey. Critical success factors include performance of knowledge management, knowledge management strategy, quality performance, and evaluation of knowledge management processes.

3. CRITICAL SUCCESS FACTORS STUDIED IN CONSTRUCTION

A variety of factors determine significant success ingredients for knowledge management in construction projects in terms of these objectives. There are many pervious researches in construction regard to identify critical success factors (CSFs) analysis. Factor analysis concerned about value management (VM) in construction was adopted to find out the factors of VM according to their degrees of importance in relation to success [11]. Cheng et al proposed a partnering framework to identify the CSFs for construction parties implementing parties implementing partnering arrangements [12]. The identified CSFs for construction projects were also broad strategic principles, which would definitely require further refinement to identify lower level factors that can be implemented as

project strategies [10]. Different types of public-private partnerships (PPPs) are identified, analyzed, and categorized various critical success factors for PPPs in general based on public-private win-win principle and systematic research approach [13]. The approach includes cast studies, literature review, and interviews with experts [13]. Chua et al. adopted a hierarchical model for construction project success to determine the relative importance of success-related factors [17].

4. ESSENTIAL INGREDIENTS FOR KNOWLEDGE MANAGEMENT SUCCESS

Several empirical studies and the opinions of industry practitioners from archival data identifying significant factors affecting the success of knowledge management projects were reviewed, and these factors are summarized in following (also see Fig. 2).

Establishment of a Reward Strategy

This factor consists of five items that focus primarily on the knowledge management strategy. Establishment of a reward strategy includes the development of a reward strategy and mechanism for knowledge management implementation, the establishment of an effective reward strategy, and the improvement of involving in knowledge management activities. In addition, this factor also explains the commitment to improving knowledge sharing within the team, receiving adequate knowledge and experience from top to bottom, support from all levels of management on the knowledge management implementations in construction.

Structure Organization in Knowledge Management Department

This factor has five items concerning the establishments of knowledge management department or organization of the enterprise. Knowledge management department should be developed in the enterprise to execute the all knowledge management activities regard to the whole construction projects. It explains that all team members could make decisions alone because of clear identification of responsibility and accountability. In addition, the establishment of sharing risks, rewards, and the willingness to exchange ideas are illustrated.

Evaluation of Knowledge management Process

Five items comprise the elements of this factor regarding the evaluation and monitoring of the knowledge management process. Evaluation and monitoring methods include the evaluation of knowledge exchanging and reuse performance, well-defined procedures and responsibilities, and determining measurable goals of individual responsibilities. The evaluation and monitoring process could be ensured by a team leader of knowledge management department champion.

Clear Definition of Objectives and Rules

This factor consists of four items that emphasize the responsibilities of participants. It clarifies that the enterprise should define clear objectives and rules to support knowledge management activities. Each member in the enterprise should understand the objectives and rules of enterprise knowledge management activities. The proper mission and rules of the knowledge management are included in this factor.

Mutual Trust

This factor includes four items pertaining to trust relationship. Each member and party should trust, rely on, and understand other parties' decisions. There will be no weak links among team members if this occurs. The issues could be resolved in a timely and responsive manner.

Mechanism to Approve Activities

There are three items in this factor that procedures and process of examining and approving knowledge material submission to improve processes, reduce duplication, and eliminate waste and barriers.

Friendly System to Exchange and Reuse Knowledge

This factor includes three items regarding the stages of knowledge management implementation. Friendly use and functional of knowledge system for knowledge exchange are considered in this factor.

Willingness to Share Knowledge

This factor includes two items that are related to the willingness to share knowledge among project participants. The willingness to share knowledge and a great deal of involvement of end-users are included in this factor.

Ability to Generate Innovative Ideas

This factor is composed of one item that all parties seek new ways to lower costs and differentiate themselves to gain competitive advantages.

Top Management Support

This factor explains the degree of top management involving and taking knowledge management seriously.

5. RESEARCH METHODOGY

The study began with a review of relevant materials from textbooks, journals, conference papers, refereed publications, research reports, and Internet information to capture background knowledge to knowledge management in construction. The objective of the literature review was to develop a study framework and to prepare for the structured interviews and questionnaire survey. CSFs can be identified based on expert opinions. The impact of experience possessed by project key personnel toward

project outcomes has been widely recognized [9,10]. All reported significant factors for knowledge management success in construction were considered to develop a list of items for empirical testing. The identified factors were verified through a series of interviews with a number of selected senior practitioners in construction knowledge management, including top management representatives, senior and junior engineers, consultants, and contractors and subcontractors in Taiwan. A total of twenty key project participants were invited for interviews to share their experience and perceptions on the benefits and problems of construction knowledge management in practice, together with the critical factors for knowledge management success in construction. The interviews were conducted in the offices, and lasted around 1 hour depending on the time allocated by the interviewees.

The questionnaire was designed to test the factors adopted when assessing the success of a construction project. Meanwhile, face-to-face interviews in the form of detailed case studies were launched to acquire an understanding of construction knowledge management in Taiwan, as well as to provide information for the refinement of the questionnaire and the development of the research. In the beginning, the draft questionnaire was reviewed by the participants during the face-to-face interviews. Because no adverse comments were received from the interviewees, the final questionnaire was taken as the final empirical questionnaire for the investigation.

A list of completed or on-going construction projects adopting the construction knowledge management approach was developed based on information obtained from the trade magazines, newspaper, and other relevant sources. All participants in construction projects were involved for the questionnaire survey. The respondents were requested to rate all knowledge management success factors and personal perceptions of knowledge management success according to a fivepoint Likert scale (1=strongly disagree and 5=strongly agree), based on their actual hands-on experience on knowledge management practice. A total of 54 valid responses were received for analysis, and the overall response rate was about 34%. The 54 returned questionnaires consisted of 13 respondents from construction organizations, 17 from consultants, 12 from main contractors, and 12 from subcontractors. Furthermore, those responses include architects, engineers, and project managers.

6. ANALYSIS OF SURVERY RESULTS

Factor analysis and multiple regressions are utilized in this study to analyze data from the survey questionnaire. Factor analysis was used to identify the underlying dimensions; whereas, multiple regression was used to seek the strongest predictors of success factors [16]. The SPSS for Windows software is used as an analysis tool. Before the analysis, all variables of construction knowledge management success

factors and personal perceptions of success were tested for potential outliers and normality. Factor analysis belong a statistical approach used to identify a relatively small number of factors that can be utilized to represent relationships among sets of many interrelated variables [15]. A regression model is a mathematical model that can relate a number of independent variables to a dependent variable. Hence, this technique is chosen as the principal tool in this study to identify the important predictors of knowledge management success. Multiple regressions were performed to explore the relative significance of the factors extracted from factor analysis on the personal perceptions of knowledge management success.

7. CONCLUSIONS

This study proposes a comprehensive investigation of knowledge management in Taiwan construction industry. It provides an overview of studies in terms of significant success factors for knowledge management implementation in construction. The main purpose of study is confirmed to be applicable and influential to the majority of knowledge management success implementation in construction projects. Ten critical success factors were extracted through a synthesis of empirical studies and opinions from 40 engineers on knowledge management divisions in construction projects. These factors formed a sound basis for the performance evaluation of knowledge management in construction projects. Five of the success factors were identified as critical from analysis results. "Establishment of a Reward Strategy," "Willingness to Share Knowledge," "Mechanism to Approve Activities," "Friendly System to Exchange and Reuse Knowledge," and "Top Management Support" proved to be essential in bringing successful outcomes to knowledge management in construction. A series of in-depth case studies on various application of knowledge management in construction projects should be considered in the future to verify the applicability and reliability of the critical success factors identified in this study. The best practice of successful knowledge management in construction industry can then be generated and used as a benchmark measure for future projects. According to questionnaire, most engineers agree and think that knowledge management in construction projects is necessary and important process to improve construction management.

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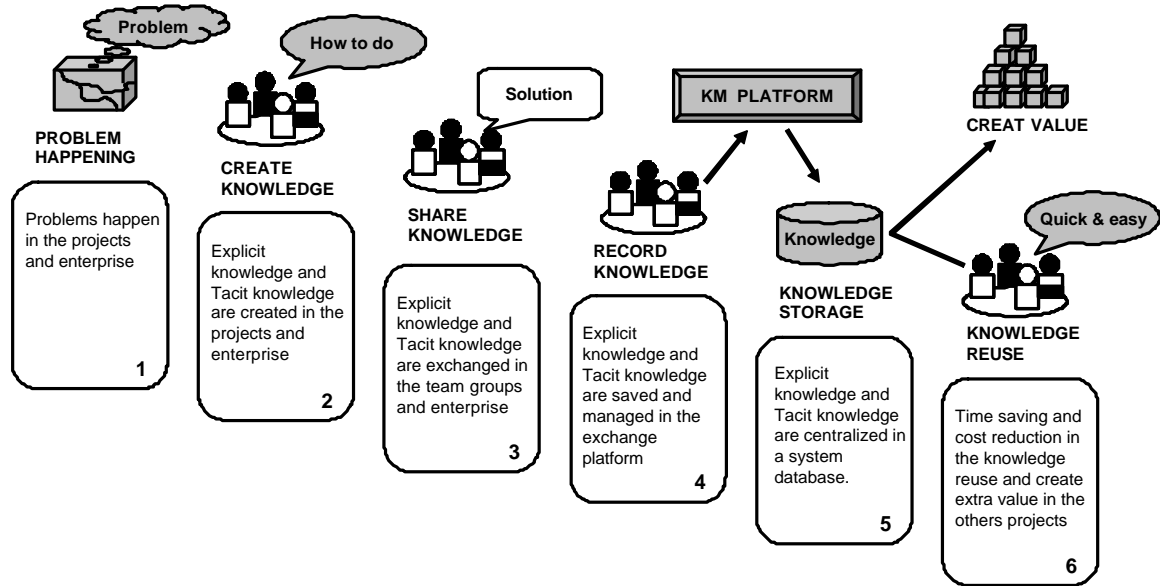


Fig. 1. The Application of Knowledge Management in Construction [18]

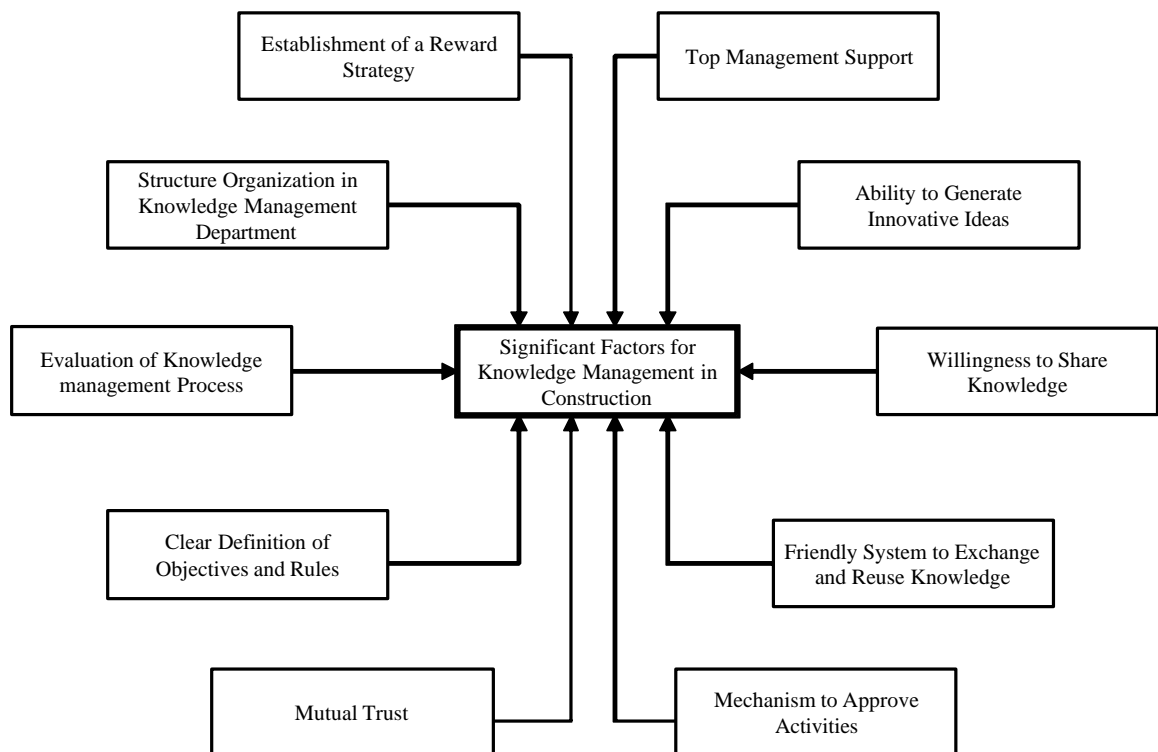


Fig. 2. Significant Factors for Knowledge Management in Construction