

Chapter 8.6

An Integrative Knowledge Management System for Environmental-Conscious Construction

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ABSTRACT

This chapter introduces an integrative knowledge management prototype named E+ for environmental-conscious construction based on a comprehensive integration of current environmental management (EM) techniques and tools in construction. The overall objective is to apply the theory of knowledge management (KM) in

EM in construction, and the authors will achieve it through developing the E+ model and its tools for dynamic EM in construction. The approaches applied in this chapter include system analysis and development, literature review, questionnaire survey and interview, and case study. The results from this chapter include the E+, a comprehensive review of EM tools adopted in construction, and a demonstration of the implementation of

the E+. Furthermore, the authors hope that the adoption and implementation of the E+ can effectively improve contractors' performance in EM and reduce adverse environmental impacts in construction.

LEARNING OBJECTIVES

Due to the purpose of the integrative methodology of KMS for EM in construction, this chapter mainly contributes to existing theory for EM in construction in the area of quantitative analytical approaches and their integrative implementation. According to the literature review and questionnaire survey for this research, the lack of effective, efficient, and economical (E3) quantitative analytical approach is one of obstacles to implementing EM in construction. Therefore, there are four points of contribution of this research to the existing theory or practice for EM in construction:

1. This research has developed an integrative methodology (E+) to implementing EMS and KM in construction, with a rigorous dynamic Environmental Impacts Assessment (EIA) model based on various functional-different approaches to EM in a construction cycle. The E+ prototype was originally created in both the theory and practice for EM in construction, and it is open to further integration of various functional-different approaches for EM in construction other than the three EM tools presented in this chapter. Because the E+ is both EMS oriented and process oriented in construction, it can thus help contractors to implement EM from a messy situation to a normalised system, and to effectively share EM knowledge and information internally and externally.
2. The CPI method integrated in the E+ model is a quantitative approach to predicting and levelling complex adverse environ-

mental impacts potentially generated from construction and transportation due to the implementation of a construction plan. As a result, the CPI method has been integrated into E+ EM Toolkit A, one functional section of the E+ system, to carry out the task in environmental-conscious construction planning.

3. The IRP method is a quantitative approach to reducing the waste of construction materials on a construction site, and it is designed to effectively be implemented by using a bar-code system. The IRP is then integrated in the E+ EM Toolkit B, another functional section of E+, as a basic component.
4. The Webfill method is an e-commerce model designed for the trip-ticket system to effectively reduce, reuse, and recycle C&D waste. Although there is a lack of data to prove the efficiency in reality, the computer simulation results and a questionnaire survey from another research (Chen, 2003) have proven that the Webfill system can effectively realise the design function. As a result, the Webfill is also integrated in the E+ model as an important component of the E+ EM Toolkit C.

Readers can obtain the socio-technical perspectives from the introduction of the E+ prototype and its toolkits, and know how E+ can work for a dynamic EIA process in construction with integrated supports from E3 quantitative analytical approaches in the toolkits.

INTRODUCTION

The adverse environmental impacts of construction—such as construction and demolition waste, noise and vibration, dust, hazards emissions and odours, soil and ground contamination, water pollution, wildlife and natural features demoli-

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