THE USE OF SYSTEM DYNAMICS MODELLING IN IMPROVING CONSTRUCTION SAFETY

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ABSTRACT

The construction project has a predetermined date of delivery, is subject to one or several performance goals, and consists of a number of complex activities. These characteristics make the construction industry one of the most hazardous industries, resulting in high rates of accidents. The main cause of construction accidents is viewed as the direct result of having a poor safety culture. Much attention has been paid to organizational safety culture, and to the development of tools for monitoring its health, in order to identify areas for safety improvement.

This paper aims to develop the construction safety culture (CSC) dynamic model, utilizing the system dynamics (SD) modeling, to capture the interactions among key factors of CSC over a period of time. The *CSC index*, developed through SD modeling, is used to measure the level of CSC maturity, and identify areas for safety improvement. Furthermore, dynamic simulations for two organizations are performed, and simulation results are investigated. The organizations could also perform a number of policy experiments to underline areas for safety improvement, and select the best policy that matches its situation.

KEY WORDS

Construction industry, CSC dynamic model, CSC improvement, CSC index, policy experiments.

INTRODUCTION

The construction industry is "the units mainly engaged in construction, repair, alteration, and renovation of buildings and other structures, and those engaged in providing building or construction trade services and specific installation activities" (Australian Bureau of Statistics, 1993). It comprises many organizations, and operates on international, national, and local scales, with participants ranging from large multinational organizations to single person operations. The projects may vary from simple dwellings to complex structures, and normally involve many changes, such as frequent teamwork rotations and high rates of unskilled workers (Rosenfeld et al., 2006). These characteristics make the construction industry one of the most hazardous industries resulting in high rates of accidents (Maloney, 2003). Construction accidents de-motivate workers, delay project progress, and adversely affect the overall cost, productivity, and reputation of the construction industry (Mohamed, 1999). According to Smith and Roth (1991), the main cause of construction accidents is the

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