

# Chapter 4

## Overview of Decision Support Systems Applied to Construction

### ABSTRACT

*The domain of construction is a very knowledge-intensive domain with so many factors involved. This implies undertaking any action requires an understanding of the different factors and how best to combine them to achieve a favourable and optimal outcome. Thus decision-making has been extensively used in the domain of construction. The aim of this chapter is to undertake a review of various decision support systems and to provide insights into their applications in the domain of construction. Specifically, the principle of cost index, sub-work chaining diagram method, linear regression and cost over-runs in time-overrun context (CCOTOV) model and Markov decision processes (MDP), ontology and rule-based systems have been reviewed. Based on the review the Markov decision processes (MDP), ontology and rule-based systems were chosen as the more suitable for the cost control case considered in this study.*

### INTRODUCTION

When a domain is overloaded with too much information and data, it presents enormous challenges to interested users. The implications of this are that interested users may be discouraged about exploring the domain, and consequently may not be able to make informed decisions about the domain. Furthermore, those who persist to

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exploit the information may not be able to achieve accurate results. This is a challenge to various sectors of countries in both the developed and developing countries. The challenge is further exacerbated by the fact that decisions about different domains are often different and requires tailoring to meet the needs of a given community. Hence, the emergence of multiplicity of decision supports systems to address the various decision-making processes of different communities. In the ensuing sections, the most common decision support systems that have been applied to construction will be examined. In critically appraising the tools, emphases will be placed on the applications of the tools on cost control.

## **BACKGROUND**

Although the concepts of decision support systems has been around for centuries, researchers actually began to systematically study and use decision-making and planning systems in the 1960's (Raymond, 1966; Turban, 1967; Urban, 1967). Decision support systems have been applied to various industries including health, banking, aviation, motor, economy, construction, etc. There is a substantial amount of evidence that suggests human intuitive judgment and decision-making can be far from optimal and deteriorates even further with complexity and stress. With regards to construction, the domain is very knowledge intensive. Decisions are often made about the different construction materials, equipment/plants, manpower, and methods to be used in a given construction projects. Furthermore, the decision making process is exacerbated by often too many occurring problems on construction sites. A summary of the different parameters that affect decision making on construction sites are presented in Table 1.

Poor management of the parameters in Table 1 often leads to cost overruns in construction projects. Past and current research have focused on studying these parameters amongst others as factors that caused cost overruns with great limitations mitigation measures that can be used in controlling cost (Olawale & Sun 2010).

## **DECISION SUPPORT SYSTEMS: WHAT ARE THERE?**

Decision support systems are interactive, computer-based systems that aid users in judgment and choice of actions or activities. There are many benefits of decision support systems applied to various domains. These include improvement in efficiency, clarity in complexity, and facilitation of communication between individuals, provide better rationale to make decisions, improve quality of decisions, etc. In general, there are five types of decision support systems reported in the literature

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