

# Chapter 4.1

## Decision Support Systems and their Application in Construction

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### ABSTRACT

Decisions are activities that we face and deal with every day. Decision support systems are used to support and improve decision making. They help people make better and faster decisions than they could make themselves. The construction industry witnessed a growth in the application of knowledge-based expert systems in the eighties and early nineties, followed by the application of fuzzy, artificial neural networks and hybrid (integrated) systems. Potential applications of the Internet in the construction industry have generated many research projects recently. The purpose of this chapter is to understand decision support systems and their basic technologies, and to review

their application in the construction industry. The construction industry is rapidly realising the need to integrate information technology and artificial intelligence into its processes in order to remain competitive.

### INTRODUCTION

Decision support systems (DSSs) are designed, built, and used to assist in and support the decision-making process. They are used by managers in direct support of managerial decision making (Keen & Wagner, 1979). "The evolution of DSS from its conception in the 1970s to the present day has seen numerous extensions of the original no-

tion. The modern-day study of DSSs must include a focus on conventional model-based systems, knowledge-based systems, artificial intelligence, expert systems, executive information systems, group support systems, data visualisation systems, and organisational decision support systems” (Marakas, 1999, p. 8). As we begin the 21<sup>st</sup> century, major changes can be observed in the way managers use computerised tools to support their decision making. Organisations can easily use the Internet and intranets to deliver high-value performance analysis applications to decision makers around the world. Today’s decision support technologies can also create an interactive interface that allows users to view and process data models with standard Web browsers with great flexibility, efficiency, and ease (Turban & Aronson, 2001).

For the construction industry, one of the most urgent challenges to its fragmented nature is the need to improve business performance and client satisfaction. It is now recognised that the management of project and organisational knowledge is necessary if construction businesses are to remain competitive and effectively respond to the needs of their clients (Kamara, Anumba, & Carrillo, 2000).

This chapter focuses on decision support systems (DSSs) and their application in construction. It starts with an overview of the DSS concept and its fundamental principles. Following that, it presents a series of sub-sections, each of which focuses on a particular theoretical aspect of decision support technologies, starting with DSS basic components and ending with artificial intelligence (AI) and the Internet’s impact on decision support systems. Finally, a number of case studies showing the application of DSSs in the construction industry are presented.

## **Learning Objectives**

1. To understand the definition of decision support systems and their major components and categories.
2. To understand different decision support technologies and their background, components, theories, and limitations.
3. To highlight the relationship between DSSs and organisations and their people.
4. To highlight the impact of the Internet on decision support.
5. To present some examples of the applications of different decision support technologies in the construction industry.
6. To discuss the impact of decision support systems and their future.

## **BACKGROUND**

Management is the process needed to achieve organisational goals through its resources. It is the dynamic input that makes an organisation work. All managerial activities revolve around decision making at various levels. Turban and Aronson (2001) describe decision making as a process of choosing among alternative courses of action for the purpose of achieving a goal or goals. According to Simon (1977), managerial decision making is synonymous with the whole process of management. For a long time, managers have considered decision making as an innate talent based on (a manager’s) creativity, intuition, judgment, and experience that gets better through a process of trial and error.

However, with the complex business environment in which management operates today, decision making is becoming more complicated. Turban and Aronson (2001) seek to explain this increased complication. They recognised, firstly, the improved technology and communications and their impact in increasing the number of available alternatives; secondly, the continuous changes in the fluctuating environment within which organisations operate and the uncertainty and risk that arises from these changes; and finally, the high cost of errors due to the complexity and magnitude of operations, automation, and the chain reaction that an error can cause in many parts of

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