Chapter XII

Empowering Modern Managers: Towards an Agent-Based Decision Support System

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ABSTRACT

This chapter discusses recent advances in the use of agent technology in Decision Support Systems (DSSs) and introduces a model for an agent-based DSS. The chapter analyzes the modern requirements for the nature of decision support and argues in favor of adopting active situated paradigm as the basis for building DSS. The benefits of agent technology are highlighted in relation to the desired features of DSS and the past research in this direction is reviewed and systematically categorized. The description of an agent-based DSS elaborating on the architecture of the system and the potential use of data mining techniques is then introduced. The approach is illustrated with an agent-based DSS for investment decisions. The chapter informs the readers about the state of art in agent-based DSS, and provides a framework that can be used as a reference model in future research in the area.

INTRODUCTION

The modern business environment is characterized by the abundance and accessibility of information available from a variety of heterogeneous sources. The success of a business largely depends on its capabilities of mining, filtering, processing,

transforming and translating this information into timely and effective managerial decisions. The focus of this chapter is on the new generation of tools for facilitating modern managerial decision-making, based on recent developments in agent technologies.

The category of systems that directly targeted managerial decision making known as DSSs were conceived in the early 1970s as the tools for informing decision making processes (Alter, 1981; Sprague & Carlson, 1982). The classical vision behind DSS was in synergistically combining human judgment with the computational power of machines. DSSs were envisaged as incorporating data and modeling tools, borrowing heavily from such areas as statistics, operations research/management science and, later, artificial intelligence. Thus, the decision maker having recognized the problem situation would invoke DSS capabilities (e.g., linear programming, Monte-Carlo simulations) in order to gain insights into the situation, assess the consequences of actions and exercise judgment to make a final decision. He or she would then take the consequent implementation of the decision into the real world.

In the past 30 years, since the conception of DSSs, the business and technological environments have changed in a number of significant ways. The most profound of these changes include:
- globalization of economy and the growing complexity of economic relationships;
- increased need for fast response in the dynamic competitive environment;
- flattening of organizations and growing employee empowerment;
- explosion of information accessible through electronic networks;
- emergence and growth of electronic commerce; and
- better-informed, better-empowered customers, competitors and suppliers.

In light of the above influences, the traditional model of DSS does not adequately serve the objectives of today's decision makers. The concept of a DSS as an isolated passive toolbox can hardly fit in the modern technological picture. There is a need for new frameworks, architectures and tools that could bring the DSS research up to the demands of the day.

One promising technology that has recently gained tremendous popularity is intelligent agents. Although intelligent agents apparently defy precise definition, they are normally characterized by a number of attributes including autonomy, reactivity, proactiveness, social ability, situatedness in the environment, purposefulness, mentalistic ascription, and others (Franklin & Graesser, 1997; Shoham, 1993; Wooldridge & Jennings, 1995). One useful metaphor to employ when thinking of agents is that of a software robot that perceives the cyber-environment in a continuous autonomous fashion, reacts to certain developments, performs delegated tasks and communicates with the principle (user) or other agents.

The development of the Internet, the increased accessibility of information, dramatic decline of computer hardware costs, development of friendly user interfaces, proliferation of information technologies into numerous aspects of business processes and personal lives and other factors paved the road for the increased level of automation, and, hence, triggered huge interest in agent-based technologies. A number of agent-oriented approaches to the business domain have been proposed and demonstrated

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