Decision-Making Support Systems

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INTRODUCTION

Decision-making support systems (DMSS) are specialized computer-based information systems designed to support some, several or all phases of the decision-making process (Forgionne et al., 2000). They have the stand-alone or integrated capabilities of decision support systems (DSS), executive information systems (EIS) and expert systems/knowledge based systems (ES/KBS). Individual EIS, DSS, and ES/KBS, or pair-integrated combinations of these systems, have yielded substantial benefits for decision makers in real applications.

The evolution of the systems has presented unique challenges and opportunities for DMSS professionals. To gain further insights about DMSS achievements, challenges, and opportunities, we asked recognized leaders in the field for their views. This article overviews the DMSS concepts, presents the expert views regarding achievements, challenges, and opportunities, and examines the implications for DMSS research and practice.

DMSS ARCHITECTURES

Decision-making support systems involve various creative, behavioral, and analytic foundations that draw on a variety of disciplines (Sage, 1981). These foundations give rise to various architectures that deliver the fundamental support concepts to individual and group users. The architectures, which are summarized in Table 1, include: (a) the classic systems (Alter, 1996), which include decision support systems (DSS), expert and knowledge based systems (ES/KBS), executive information systems (EIS), group support systems (GSS), and spatial decision support systems (SDSS) and (b) new systems (Forgionne, 1991; Forgionne et al., 2002; Gray & Watson, 1996; Mora et al., 2003; Power, 2002; Turban & Aronson, 1998), which include management support systems (MSS), decision technology systems (DTS), Integrated DMSS, data warehouse (DW)-based and data mining (DM)-based DMSS (DW&DM-DMSS), intelligent DMSS (i-DMSS), and Web-based DMSS or knowledge management DMSS.

The architectures have been applied to a variety of public and private enterprise problems and opportunities, including the planning of large-scale housing demand (Forgionne, 1997), strategic planning (Savolainen & Shuhua, 1995), urban transportation policy formulation (Rinaldi & Bain, 2002), health care management (Friedman & Pliskin, 2002), decision making in the pharmaceutical industry (Gibson, 2002), banking management (Hope & Wild, 2002), entertainment industry management (Watson & Volovino, 2002) and the military arena (Findler, 2002). The reported, and other applications, draw on advanced information technologies (IT), including intelligent agents (Chi & Turban, 1995), knowledge-based (Grove, 2002) and knowledge-management procedures (Alavi, 1997), synthetic characters (Pistolesi, 2002), and spatial decision support systems (Silva et al., 2002) among others.

DMSS ACHIEVEMENTS AND FUTURE TRENDS

Once created, DMSS must be evaluated and managed. A variety of approaches have been suggested to measure DMSS effectiveness. There are economic theory-based methodologies, quantitative and qualitative process and outcome measures, and the dashboard approach. These approaches suggest various organizational structures and practices for managing the design, development, and implementation effort. Most of these approaches suggest much more user involvement than had heretofore been

Table 1. Decision-making support systems architectures

Classic DMSS Architectures	Description	Main Decision-Making Phase Supported					DMSS' SUPPORT CHARACTERISTICS
		INTELLIGENCE	DESIGN	CHOICE	IMPLEMENTATION	LEARNING	
DSS	A DSS is an interactive computer-based system composed of a user-dialog system, a model processor and a data management system, which helps decision makers utilize data and quantitative models to solve semi-structured problems.			**A**			(A) What-if, goal-seeking & sensitivity analysis.
ES & KBS	An ES/KBS is a computer-based system composed of a user-dialog system, an inference engine, one or several intelligent modules, a knowledge base and a work memory, which emulates the problem-solving capabilities of a human expert in a specific domain of knowledge.	**A**		**B**			(A&B) Symbolic pattern-based recognition; fuzzy data; how and why explanation facilities.
EIS	An EIS is a computer-based system composed of a user-dialog system, a graph system, a multidimensional database query system and an external communication system, which enables decision makers to access a common core of data covering key internal and external business variables by a variety of dimensions (such as time and business unit).	**A**			**B**		(A&B) Key performance indicators (KPIs) in graphs and text tables; data exploring and searching through drill-down, roll-up, slice and dice and pivoting operations; networking communications to internal and external bulletin boards.
GSS	A GSS an integrated computer-based system composed of a communication sub-system and model-driven DMSS (DSS), to support problem formulation and potential solution of unstructured decision problems in a group meeting.		**A**	**B**			(A) Idea generation through brainstorming facilities; pooling and display of ideas; generation of alternatives and criteria. (B) Preference models; voting schemes; conflict negotiation support.
SDSS	A SDSS a computer-based system composed of a user-dialog sub-system, a geographic/spatial database sub-system, a decision model sub-system and a set of analytical tools, which enables decision makers to examine situations based strongly on spatial data.	**A**		**B**			(A) Spatial data searching support; visualization tools for maps, satellite images and digital terrains. (B) What-if analysis of scenarios, goal-seeking analysis, sensitivity analysis of decision variables upon spatial data.