Chapter 4.7
The Implementation of Large-Scale Decision-Making Support Systems:
Problems, Findings, and Challenges

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ABSTRACT

This article reviews the literature-based issues involved in implementing large-scale decision-making support systems DMSSs. Unlike previous studies, this review studies holistically three types of DMSSs (model-based decision support systems, executive-oriented decision support systems, and knowledge-based decision support systems) and incorporates recent studies on the simulation of the implementations process. Such an article contributes to the literature by organizing the fragmented knowledge on the DMSS implementation phenomenon and by communicating the factors and stages involved in successful or failed large-scale DMSS implementations to practitioners.

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INTRODUCTION

This article reviews the literature-based issues involved in implementing large-scale decision-making support systems (DMSSs). Unlike previous studies, this review studies holistically three types of DMSSs (model-based decision support systems, executive-oriented decision support systems, and knowledge-based decision support systems) and incorporates recent studies on the simulation of the implementations process. The chapter ends with a brief discussion of the practical and research challenges for the implementation process. Such a study contributes to the literature by organizing the fragmented knowledge on the DMSS implementation phenomenon and by communicating the factors and stages involved in successful or failed DMSS implementations to practitioners.

A large-scale DMSS can be defined as a specialized computer-based information system designed to support some, several, or all phases of a decision-making process that requires substantive financial, organizational, human, technical, and knowledge resources for being deployed in organizations (Forgionne, 1991; Forgionne, Mora, Cervantes, & Kohli, 2000; Turban, 1995). From its initial theoretical conceptualization (in the early 1970s by Scott Morton, 1971) until now (Forgionne, Mora, Gupta, & Gelman, 2005), these systems have been designed with different architectures. Consequently, these systems have also provided distinctive decision support. Such systems can be grouped into four main categories: model-based decision support systems (Sprague & Carlson, 1982), executive-oriented decision support systems (Rockart, 1979), knowledge-based decision support systems (Feigenbaum, McCorduck, & Nii, 1988), and general decision-making support systems (Forgionne et al., 2000). Table 1 summarizes the main support provided by each type of DMSS.

Large-scale DMSSs are highly appreciated and required in large organizations because relevant benefits can be achieved after a successful implementation. Among the main benefits reported are better decision quality, enhancement of decision makers' mental models, improved analytical skills, better communication, and a reduction in decision time (Eom, Lee, Kim, & Somarajan, 1998; Feigenbaum et al., 1988; Leidner, 1996; Liebowitz, 1990; Rockart & DeLong, 1988; Turban, 1995; Tyran & George, 1993; Udo & Guimaraes, 1994; Watson, Rainer, & Koh, 1991). Still, failures in DMSS implementation are not scarce and are economically significant (Alavi & Joachiminsthaler, 1992; Gill, 1995; Glover & Watson, 1992). The main reported causes of failure (Mora, Cervantes, Gelman, Forgionne, Mejia, & Weitzenfeld, 2002; Mora, Forgionne, Gelman, Cervantes, Weitzenfeld, & Raczyinski, 2003) are the inherent high complexity of the overall process, where multiple financial, organizational, human, technological, sociocultural, and political issues in-

Table 1. Decisional support of main types of DMSSs

PHASE/ ACTIVITY	Model-Based DSS	Executive-Oriented DSS	Knowledge-Based DSS	General DMSS
INTELLIGENCE • Identify objectives • Recognize problem • Gather data	Few explored	• Drill-down analysis • Data query • Graph & tabular data access • DM/KD analysis	• Qualitative reasoning • Problem solving • Intelligent advice	• Decisional support from executive and knowledge-based DSS modules
DESIGN • Formulate model • Establish criteria • Generate alternatives	Few explored	Few explored	• Qualitative reasoning • Problem solving • Intelligent advice	• Decisional support from knowledge-based DSS modules
CHOICE • Evaluate alternatives • Select best alternative	• What-if analysis • Goal-seeking analysis • Sensitivity analysis • Value/utility analysis	Few explored	• Qualitative reasoning • Problem solving • Intelligent advice	• Decisional support from model-and knowledge-based DSS modules
IMPLEMENTATION • Decision confidence • System effectiveness • Implement decision	Few explored	• Drill-down analysis • Data query • Graph & tabular data access	Few explored	• Decisional support from executive-based DSS module
LEARNING • Analysis • Synthesis	Few explored	Few explored	• Automated learning (CBR, NN, etc.)	• Decisional support from related tools like knowledge management system (KMS)