Chapter 3
IDSSE-M:
A Software System Engineering Methodology for Developing Intelligent Decision-Making Support Systems

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ABSTRACT

Decision-making Support Systems (DMSSs) have been traditionally designed and built by using mainly the Waterfall method, Prototyping-Evolutive, or Adaptive approach in the last three decades. In this paper, the authors argue that while such approaches have guided to DMSS developers, they have been also demanded for adding ad-hoc, non-standardized activities and extra techniques based on their own expertise due to the scarcity of open-access available information of them. Additionally, from a Software Systems Engineering (SSE) viewpoint, such approaches cannot be considered as well-defined methodologies. This article contributes to the research stream of SSE-based DMSS development methodologies by reporting an initial empirical evaluation of IDSSE-M, a free-access methodology for designing and building Intelligent Decision Support Systems. IDSSE-M extends and adapts Turban and Aronson's DSS Building Paradigm (open access), and Saxena's Decision Support Engineering Methodology (proprietary). IDSSE-M offers DMSS developers at least a moderate level of usefulness, compatibility, and results demonstrability, which leads to a positive, good and beneficial attitude of using the methodology.

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1. INTRODUCTION

Decision Support Systems (DSS) (Keen & Scott-Morton, 1978) or their current and integrated versions referred to as Decision-making Support Systems (DMSS) (Forgionne, Mora, Gupta, & Gelman, 2005), are Information Systems (IS) designed specially to support some, several or all phases of an individual, team, organizational or intra-organizational decision-making process. Ever since its origin in the early 1970s (Scott-Morton, 1971), organizations, mainly large-scale ones with available special staffs and external consultants, have pursued the development of DMSS (McCosh & Correa-Perez, 2006) - in order to achieve many of the expected benefits as reported in Table 1.

With the high interest of large-scale organizations for implementing DMSS, it has been also widely documented that achieving a successful implementation of a DMSS is a complex task (Mora, Forgionne, Gelman, Cervantes, Weitzenfeld, & Raczyinski, 2003). Among the multiple categories of DMSS implementation success factors reported in the literature (i.e., *User, Task, Development Team, Process, Technology, Organization, Environment* and the *System* per se), the existence and utilization of a suitable development methodology (Watson, Rainer, & Koh, 1991; Eierman, Niederman, & Adams, 1995; Turban, 1992) has been identified as relevant in the Process category. Although several coarse-grain DMSS development approaches such as Prototyping-Evolutive (Courbon et al., 1980; Alavi & Henderson, 1981; Alavi, 1984; Mahmood & Medewitz, 1985), Adaptive (Keen, 1980; Alavi & Napier, 1984), and Representation-based Method (Carlson, 1979) have been reported during the last 30 years, they strictly cannot be considered as development methodologies because they do not provide all of the expected elements including phases, activities, roles, artifacts and tools (Oktaba & Ibarguengoita, 1989). Consequently, while they have guided multiple DMSS development in real settings, the DMSS developers have been also demanded by adding ad-hoc expertise. Thus, DMSS development could be considered more an Art than an Engineering well-defined process (Saxena, 1991; Gachet & Haettenschwiler, 2006).

Similarly, there was a lack of development methodologies in the early Information System (IS) and Software Engineering development arenas (Avison & Fitzgerald, 2003) as well as in the

Table 1. Benefits of using DMSS

Purposes and Needs for Using Model-Based DSS (DSS)	**Purposes and Needs for Using Executive-Based DSS (EIS)**
• Improve the quality of decisions. • Increase productivity of analysts. • Facilitate communication between decision makers and analysts. • Save analysis time. • Support objective-based decisions. • Reduce costs derived from wrong decisions. • Incorporate decision-makers insights and judgments into analysis.	• Increased competition. • A highly dynamic business environment. • Need of a fast executive response. • Need of timely executive information. • Need of improved communications. • Need of rapid status on operational data. • Scan the external decision environment. • Capture, filter, and focus on external and internal data.
Purposes and Needs for Using Knowledge-Based DSS (ES)	**Purposes and Needs for Using General-Based DSS (DMSS)**
• Preserve valuable and scarce knowledge. • Share valuable and scarce knowledge. • Enhance problem solving abilities of users. • Develop user's job skills. • Increase productivity. • Improve quality of solution provided. • Guide the user through the problem solving process. • Provide explanations for recommended actions.	• Improve some or several phases of an individual, team or organizational decision-making process. • Increase the probabilities of better outcomes of a decision-making process. • Improve the decision makers' shared-vision of the organization • Seek efficiency and effectiveness of top decision makers regarding decisional tasks. • Explore consequences of critical decisions before them be taken and implemented.