

Decision Support Systems Concept

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INTRODUCTION

Since the late 1960s, researchers have been developing and implementing computerized systems to support management decision makers. A number of decision support system (DSS) typologies were proposed in the early 1980s (Alter, 1980; Sprague & Carlson, 1982), but technology developments and new applications led to an expanded DSS framework (Power, 2000a, 2000b, 2001). The expanded DSS framework that is explained in detail in Power (2002b) helps decision makers and DSS developers understand and categorize decision support projects as well as existing decision support systems.

Many terms are used to describe decision support systems. For example, some vendors and managers use the terms business intelligence, collaborative systems, computationally oriented DSS, data warehousing, model-based DSS, and online analytical processing (OLAP) software to label decision support systems. Software vendors use these more specialized terms for both descriptive and marketing purposes. The terms used to describe decision support capabilities are important in making sense about what technologies have been deployed or are needed. Some DSSs are subsystems of other information systems and this integration adds to the complexity of categorizing and identifying DSSs. In general, decision support systems are a broad class of information systems used to assist people in decision-making activities (Power, 2004).

Decision support systems can “take on many different forms and can be used in many different ways” (Alter, 1980, p. 71). DSSs differ in terms of capabilities and targeted users of a specific system, and in terms of how the DSS is implemented and what it is called. Some DSSs focus on data, some on models, and some on facilitating communications and collaboration. DSSs also differ in scope: Some DSSs are intended for one primary user and are used as a stand-alone program on a personal computer for analysis, and other DSSs are intended for many users in an organization and are deployed as enterprise-wide Web-based systems.

BACKGROUND

Traditionally, academics and IS practitioners have discussed building decision support systems in terms of four major components: (a) the user interface, (b) the database, (c) the models and analytical tools, and (d) the DSS architecture and network (Sprague & Carlson, 1982). This traditional list of components identifies similarities and differences between categories or types of DSSs. The expanded DSS framework is primarily based on the differential emphasis placed on the DSS components when systems are actually constructed. The importance of each component in providing decision support functionality is the major differentiating factor among various categories of DSSs.

The expanded DSS framework focuses on one major dimension with five categories and three secondary dimensions. The major characteristic in the framework is the dominant technology component that drives or provides the decision support functionality. Five generic categories based on the dominant component are discussed in this section: communications-driven, data-driven, document-driven, knowledge-driven, and model-driven decision support systems. These categories can classify DSSs currently in use. Their explanations are based on Power (2001, 2002b, 2004).

Communications-driven DSSs include systems built using communication, collaboration, and decision support technologies. These systems were first developed in the late 1980s and were called groupware. Group DSSs (GDSSs) also involve communications, but many GDSSs derive their functionality by providing a group of users with access to quantitative decision models and hence are more appropriately classified as model-driven DSSs.

Data-driven DSSs include file-drawer and management reporting systems, data warehousing and analysis systems, executive information systems (EISs), and some spatial DSSs (SDSSs). Business intelligence (BI) systems are also examples of data-driven DSSs. Data-driven DSSs emphasize access to and manipulation of large databases of structured data and especially a

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Table 1. Summary of Power's (2002b) expanded DSS framework

Dominant Component	User Group	Purpose	Enabling Technology
Communications Communications-Driven DSS	Intra- and interorganizational users	Conduct a meeting, post on a bulletin board	Web based or LAN (local area network)
Database Data-Driven DSS	Managers, staff, intra- and interorganizational users	Query a data warehouse, ad hoc analysis	Mainframe, LAN, Web based
Document Base Document- Driven DSS	Specialists, managers	Search Web pages, find documents	Web based
Knowledge Base Knowledge- Driven DSS	Internal users, customers	Management advice, choose products	LAN or Web based
Model Model-Driven DSS	Managers, staff, customers	Crew scheduling, decision analysis	Stand-alone PC, Web based

time series of internal company data and sometimes external data. Simple file systems accessed by query and retrieval tools provide the most elementary level of functionality. Data warehouse systems that allow the manipulation of data by computerized tools tailored to a specific task and setting or by more general tools and operators provide additional functionality. Data-driven DSSs with OLAP, drill down, and scorecards provide the highest level of functionality and decision support that is linked to the analysis of a large collection of historical data.

Document-driven DSSs integrate a variety of storage and processing technologies to provide complete document retrieval, summarization, and analysis. A search tool that creates text summaries and rates document relevance provides decision support functionality, but the dominant component is the document base. Examples of documents that might be included in a document database include policies and procedures, product specifications, catalogs, and corporate historical information, including minutes of meetings, corporate records, and important correspondence.

Knowledge-driven DSSs can suggest or recommend actions to managers. These DSSs contain specialized problem-solving expertise based upon artificial intelli-

gence and statistics technologies. The expertise consists of knowledge about a particular domain, understanding of problems within that domain, and skill at solving some of these problems.

Model-driven DSSs include systems that use accounting and financial models, representational simulation models, and optimization models. Model-driven DSSs emphasize access to and manipulation of a model. A simple algebraic model with "what-if" analysis provides the most elementary level of model-driven DSS functionality.

Table 1 summarizes the five categories or types of decision support systems and the expanded DSS framework. Data-driven, document-driven, and knowledge-driven DSSs need very different and specialized database components to provide decision support. A data-driven DSS uses a relational or multidimensional database of structured data. A document-driven DSS has a specialized document repository and in some instances a relational database to assist in document searching. A knowledge-driven DSS stores knowledge using rules, frames, or likelihood data. A model-driven DSS derives functionality from the model component in the DSS architecture. Finally, the communications and networking component is the key driver for communications-driven DSSs.

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