Decision Support Systems: An Overview

Jason C.H. Chen, Ph.D.
Professor of MIS
School of Business Administration
Gonzaga University
Spokane, WA 99258
chen@jepson.gonzaga.edu

Decision Support Systems

- Decision Support Methodology
- Technology Components
- Development

DSS Configurations

- Supports individuals and teams
- Used repeatedly and constantly
- Two major components: data and models
- Web-based
- Uses subjective, personal, and objective data
- Has a simulation model
- Used in public and private sectors
- Has what-if and goal-seeking capabilities
- Uses quantitative and qualitative models

Working Definition of DSS

- A DSS is an interactive, flexible, and adaptable CBIS, specially developed for supporting the solution of a non-structured management problem for improved decision making. It utilizes data, it provides easy user interface, and it allows for the decision maker’s own insights
- DSS may utilize models, is built by an interactive process (frequently by end-users), supports all the phases of the decision making, and may include a knowledge component

DSS Definitions

- Little (1970)
  “model-based set of procedures for processing data and judgments to assist a manager in his decision making”
  Assumption: that the system is computer-based and extends the user’s capabilities.
- Alter (1980)
  Contrasts DSS with traditional EDP systems
- Central Issue in DSS
  support and improvement of decision making
DSS versus EDP

<table>
<thead>
<tr>
<th>Dimension</th>
<th>DSS</th>
<th>EDP</th>
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</thead>
<tbody>
<tr>
<td>Use</td>
<td>Active</td>
<td>Passive</td>
</tr>
<tr>
<td>User</td>
<td>Line and staff management</td>
<td>Clerical</td>
</tr>
<tr>
<td>Goal</td>
<td>Effectiveness</td>
<td>Mechanical efficiency</td>
</tr>
<tr>
<td>Time Horizon</td>
<td>Present and future</td>
<td>Past</td>
</tr>
<tr>
<td>Objective</td>
<td>Flexibility</td>
<td>Consistency</td>
</tr>
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Characteristics and Capabilities of DSS

1. Provide support in semi-structured and unstructured situations, includes human judgment and computerized information
2. Support for various managerial levels
3. Support to individuals and groups
4. Support to interdependent and/or sequential decisions
5. Support all phases of the decision-making process
6. Support a variety of decision-making processes and styles
7. Are adaptive
8. Have user friendly interfaces
9. Goal: improve effectiveness of decision making
10. The decision maker controls the decision-making process
11. End-users can build simple systems
12. Utilizes models for analysis
13. Provides access to a variety of data sources, formats, and types

Decision makers can make better, more consistent decisions in a timely manner

DSS Components

1. Data (Base) Management Subsystem
2. Model (Base) Management Subsystem
3. Knowledge-based (Management) Subsystem
4. User Interface Subsystem (Dialogue)
5. The User

Figure: Components of the DSS
The Data Management Subsystem

- DSS database
- Database management system
- Data directory
- Query facility (SQL, QBE, QBF)

Database Management Systems in DSS

- **DBMS**: Software program for entering (or adding) information into a database; updating, deleting, manipulating, storing, and retrieving information
- A DBMS + modeling language to develop DSS
- DBMS to handle LARGE amounts of information

DSS Database Issues

- Data warehouse
- Data mining
- Special independent DSS databases
- Extraction of data from internal, external, and private sources
- Web browser data access
- Web database servers
- Multimedia databases
- Special GSS databases (like Lotus Notes / Domino Server)
- Online Analytical Processing (OLAP)
- Object-oriented databases
- Commercial database management systems (DBMS)

DSS In Focus 3.2: The Capabilities of DBMS in a DSS

- Captures/extracts data for inclusion in a DSS database
- Updates (adds, deletes, edits, changes) data records and files
- Interrelates data from different sources
- Retrieves data from the database for queries and reports
- Provides comprehensive data security (protection from unauthorized access, recovery capabilities, etc.)
- Handles personal and confidential data so that users can experiment with alternative solutions based on their own judgment
- Performs complex data manipulation tasks based on queries
- Tracks data use within the DSS
- Manages data through a data dictionary

The Model Management Subsystem

- Analog of the database management subsystem
- Model base
- Model base management system
- Modeling language
- Model directory
- Model execution, integration, and command processor

Model Management Issues

- **Model level**: Strategic, managerial (tactical), and operational
- Modeling languages
- Lack of standard MBMS activities.
- Use of AI and fuzzy logic in MBMS (explanation facility)
The Knowledge Based (Management) Subsystem

- Provides expertise in solving complex unstructured and semi-structured problems
- Expertise provided by an expert system or other intelligent system
- Advanced DSS have a knowledge based (management) component
- Leads to intelligent DSS
- Example: Data mining

The User Interface (Dialog) Subsystem

- Includes all communication between a user and the MSS
- Graphical user interfaces (GUI)
- Voice recognition and speech synthesis possible
- To most users, the user interface is the system (because the entire system is totally transparent to the user)

The User

Different usage patterns for the user, the manager, or the decision maker

- Managers
- Staff specialists
- Intermediaries
  1. Staff assistant
  2. Expert tool user
  3. Business (system) analyst
  4. GSS Facilitator

DSS Hardware

Evolved with computer hardware and software technologies

Major Hardware Options

- Mainframe
- Workstation
- Personal computer
- Web server system
  - Internet
  - Intranets
  - Extranets

Distinguishing DSS from Management Science and DBMS

- DSS is a problem-solving tool and is frequently used to address ad hoc and unexpected problems
- Different than DBMS
- DSS evolve as they develop

DSS Classifications

Alter’s Output Classification (1980)

- Degree of action implication of system outputs (supporting decision) (Table 3.3)

- Holsapple and Whinston’s Classification
  1. Text-oriented DSS
  2. Database-oriented DSS
  3. Spreadsheet-oriented DSS
  4. Solver-oriented DSS
  5. Rule-oriented DSS
  6. Compound DSS
  7. Modeling language-based DSS (IFPS, System W)
Intelligent DSS Categories

- Descriptive
- Procedural
- Reasoning
- Linguistic
- Presentation
- Assimilative

Summary

- Fundamentals of DSS
- Components of DSS
- Major capabilities of the DSS components
- Major DSS categories