Fundamentals of Information Systems, Seventh Edition

Chapter 6
Information and Decision Support Systems
Principles and Learning Objectives

• Good decision-making and problem-solving skills are the key to developing effective information and decision support systems
  – Define the stages of decision making
  – Discuss the importance of implementation and monitoring in problem solving
Principles and Learning Objectives (continued)

• The management information system (MIS) must provide the right information to the right person in the right format at the right time
  – Explain the uses of MISs and describe their inputs and outputs
  – Discuss information systems in the functional areas of business organizations
Principles and Learning Objectives (continued)

• Decision support systems (DSSs) are used when the problems are unstructured
  – List and discuss important characteristics of DSSs that give them the potential to be effective management support tools
  – Identify and describe the basic components of a DSS
Principles and Learning Objectives (continued)

- Specialized support systems, such as group support systems (GSSs) and executive support systems (ESSs), use the overall approach of a DSS in situations such as group and executive decision making
  - State the goals of a GSS and identify the characteristics that distinguish it from a DSS
  - Identify the fundamental uses of an ESS and list the characteristics of such a system
  - List and discuss other special-purpose systems
Why Learn About Information and Decision Support Systems?

• True potential of information systems:
  – Is in helping you and your coworkers make more informed decisions

• The result can be increased revenues, reduced costs, and the realization of corporate goals
Decision Making and Problem Solving

• Every organization needs effective decision making
• In most cases, strategic planning and overall goals of the organization set the course for decision making
• Information systems assist with problem solving, helping people make better decisions and save lives
Decision Making as a Component of Problem Solving

• Decision-making phase:
  – Intelligence stage:
    • Identify and define potential problems or opportunities
  – Design stage:
    • Develop alternative solutions to the problem and evaluate their feasibility
  – Choice stage:
    • Select a course of action
Decision Making as a Component of Problem Solving (continued)

FIGURE 6.1
How decision making relates to problem solving
The three stages of decision making—intelligence, design, and choice—are augmented by implementation and monitoring to result in problem solving.
Decision Making as a Component of Problem Solving (continued)

• Problem solving:
  – Includes and goes beyond decision making
  – Includes implementation and monitoring stage

• Monitoring stage:
  – Decision makers evaluate the implementation
    • Were anticipated results achieved
    • Is there a need for further modification
Programmed versus Nonprogrammed Decisions

• Programmed decisions:
  – Made using a rule, procedure, or quantitative method
  – Easy to computerize using traditional information systems

• Nonprogrammed decisions:
  – Decisions that deal with unusual or exceptional situations
  – Not easily quantifiable
Optimization, Satisficing, and Heuristic Approaches

• Optimization model:
  – Finds the best solution, usually the one that will best help the organization meet its goals

• Satisficing model:
  – Finds a good, but not necessarily the best, problem solution

• Heuristics:
  – Commonly accepted guidelines or procedures that usually find a good solution
The Benefits of Information and Decision Support Systems

• Decision support systems:
  – Performance is typically a function of decision quality and problem complexity

• Problem complexity:
  – Depends on how hard the problem is to solve and implement
The Benefits of Information and Decision Support Systems (continued)

**FIGURE 6.3**

Benefits of information and decision support systems

- **Positive impact**
  - Performance
    - Decision quality
    - Problem complexity

- **Negative impact**
  - Cost
    - Hardware
    - Software
    - Database
    - Networks and Internet
    - Personnel
    - Procedures
An Overview of Management Information Systems

• Management information system (MIS):
  – Integrated collection of people, procedures, databases, and devices that provides managers and decision makers with information to help achieve organizations' goals
  – Can give the organization a competitive advantage
Management Information Systems in Perspective

• Purpose of an MIS:
  – To help an organization achieve its goals by providing managers with insight into the regular operations of the organization
  – Provide the right information to the right person in the right format at the right time

• Business transactions:
  – Can enter the organization through traditional methods, or via the Internet, or via an extranet
Management Information Systems in Perspective (continued)

FIGURE 6.4
Sources of managerial information
The MIS is just one of many sources of managerial information. Decision support systems, executive support systems, and expert systems also assist in decision making.
Inputs to a Management Information System

• **Internal data sources:**
  – TPS and ERP systems and related databases
  – Data warehouses and data marts
  – Specific functional areas throughout the firm

• **External data sources:**
  – Customers, suppliers, competitors, and stockholders whose data is not already captured by the TPS and ERP systems
  – Internet
Outputs of a Management Information System

• Scheduled reports:
  – Produced periodically, such as daily, weekly, or monthly
  – *Key-indicator* report summarizes the previous day’s critical activities

• Demand reports:
  – Developed to provide certain information upon request
Outputs of a Management Information System (continued)

• Exception reports:
  – Automatically produced when a situation is unusual or requires management action
  – Trigger points should be set carefully

• Drill-down reports:
  – Provide increasingly detailed data about a situation
Characteristics of a Management Information System

• MISs perform the following functions:
  – Provide reports with fixed and standard formats
  – Produce hard-copy and soft-copy reports
  – Use internal data stored in computer system
  – Allow users to develop custom reports
  – Require user requests for reports developed by systems personnel
Functional Aspects of the MIS

• Most organizations are structured along functional areas
• MIS can be divided along functional lines to produce reports tailored to individual functions
Financial Management Information Systems

• Financial MIS:
  – Provides financial information to executives and others

• Some financial MIS subsystems and outputs:
  – Profit/loss and cost systems
  – Auditing
  – Uses and management of funds
Manufacturing Management Information Systems

• Manufacturing MIS subsystems and outputs:
  – Used to monitor and control the flow of materials, products, and services through the organization

• Common information subsystems and outputs used in manufacturing:
  – Design and engineering
  – Master production scheduling
  – Inventory control
  – Process control
  – Quality control and testing
Marketing Management Information Systems

• Marketing MIS:
  – Supports product development, distribution, pricing decisions, promotional effectiveness, and sales forecasting
  – Marketing functions increasingly being performed on the Internet and mobile devices

• Subsystems:
  – Marketing research
  – Product development and delivery
  – Promotion and advertising
  – Product pricing
  – Sales analysis
Human Resource Management Information Systems

• Concerned with activities related to previous, current and potential employees

• Subsystems:
  – Human resource planning
  – Personnel selection and recruiting
  – Training and skills inventory
  – Scheduling and job placement
  – Wage and salary administration
  – Outplacement
Other Management Information Systems

• Accounting MIS:
  – Provides aggregate information on accounts payable, accounts receivable, payroll, and many other applications

• Geographic information system (GIS):
  – Capable of assembling, storing, manipulating, and displaying geographically referenced information
An Overview of Decision Support Systems

• DSS:
  – Organized collection of people, procedures, software, databases, and devices used to help make decisions that solve problems

• Focus of a DSS:
  – Is on decision-making effectiveness regarding unstructured or semistructured business problems
Characteristics of a Decision Support System

• Some important characteristics:
  – Provide rapid access to information
  – Handle large amounts of data from different sources
  – Provide report and presentation flexibility
  – Offer both textual and graphical orientation
  – Support drill-down analysis
Characteristics of a Decision Support System (continued)

• Perform complex, sophisticated analysis and comparisons using advanced software
• Support optimization, satisficing, and heuristic approaches
• Perform simulation analysis
• Forecast a future opportunity or problem
Capabilities of a Decision Support System

• Support problem-solving phases:
  – A specific DSS might support only one or a few phases

• Support various decision frequencies:
  – *Ad hoc DSS* is concerned with situations or decisions that come up only a few times
  – *Institutional DSS* handles situations or decisions that occur more than once
Capabilities of a Decision Support System (continued)

• Support various problem structures:
  – *Highly structured problems* are straightforward, requiring known facts and relationships
  – *Semistructured or unstructured problems* are more complex

• Support various decision-making levels:
  – DSSs can provide help for managers at various levels within the organization – operational, tactical, and strategic
Capabilities of a Decision Support System (continued)

**FIGURE 6.16**

**Decision-making level**

Strategic managers are involved with long-term decisions, which are often made infrequently. Operational managers are involved with decisions that are made more frequently.
A Comparison of DSS and MIS

• DSS differs from an MIS in numerous ways, including:
  – The type of problems solved
  – The support given to users
  – The decision emphasis and approach
  – The type, speed, output, and development of the system used
## A Comparison of DSS and MIS

<table>
<thead>
<tr>
<th>Factor</th>
<th>DSS</th>
<th>MIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem type</td>
<td>Can handle unstructured problems that cannot be easily programmed.</td>
<td>Normally used only with structured problems.</td>
</tr>
<tr>
<td>Users</td>
<td>Supports individuals, small groups, and the entire organization. In the short run, users typically have more control over a DSS.</td>
<td>Supports primarily the organization. In the short run, users have less control over an MIS.</td>
</tr>
<tr>
<td>Support</td>
<td>Supports all aspects and phases of decision making; it does not replace the decision maker—people still make the decisions.</td>
<td>In some cases, makes automatic decisions and replaces the decision maker.</td>
</tr>
<tr>
<td>Emphasis</td>
<td>Emphasizes actual decisions and decision-making styles.</td>
<td>Usually emphasizes information only.</td>
</tr>
<tr>
<td>Approach</td>
<td>Serves as a direct support system that provides interactive reports on computer screens.</td>
<td>Typically serves as an indirect support system that uses regularly produced reports.</td>
</tr>
<tr>
<td>System</td>
<td>Uses computer equipment that is usually online (directly connected to the computer system) and related to real time (providing immediate results). Computer terminals and display screens are examples—these devices can provide immediate information and answers to questions.</td>
<td>Uses printed reports that might be delivered to managers once per week, so it cannot provide immediate results.</td>
</tr>
<tr>
<td>Speed</td>
<td>Is flexible and can be implemented by users, so it usually takes less time to develop and is better able to respond to user requests.</td>
<td>Provides response time usually longer than a DSS.</td>
</tr>
<tr>
<td>Output</td>
<td>Produces reports that are usually screen oriented, with the ability to generate reports on a printer.</td>
<td>Is oriented toward printed reports and documents.</td>
</tr>
<tr>
<td>Development</td>
<td>Has users who are usually more directly involved in its development. User involvement usually means better systems that provide superior support. For all systems, user involvement is the most important factor for the development of a successful system.</td>
<td>Is frequently several years old and often was developed for people who are no longer performing the work supported by the MIS.</td>
</tr>
</tbody>
</table>
Components of a Decision Support System

• At the core of a DSS are a database and a model base

• User interface (dialogue manager):
  – Allows decision makers to easily access and manipulate the DSS and to use common business terms and phrases

• Access to the Internet, networks, and other computer-based systems
Components of a Decision Support System (continued)

**FIGURE 6.17**
Conceptual model of a DSS
DSS components include a model base; database; external database access; access to the Internet and corporate intranet, networks, and other computer systems; and a user interface or dialogue manager.
The Database

• **Database management system:**
  – Allows managers and decision makers to perform qualitative analysis on data stored in company’s databases, data warehouses, and data marts
  – Can also be used to connect to external databases

• **Data-driven DSS:**
  – Often employs data mining and business intelligence
The Model Base

• Model base:
  – Allows managers and decision makers to perform quantitative analysis on both internal and external data

• Model-driven DSS:
  – Performs mathematical or quantitative analysis

• Model management software (MMS):
  – Coordinates the use of models in a DSS
The Model Base (continued)

Table 6.2 Model management software

DSSs often use financial, statistical, graphical, and project-management models.

<table>
<thead>
<tr>
<th>Model Type</th>
<th>Description</th>
<th>Software</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial</td>
<td>Provides cash flow, internal rate of return, and other investment analysis</td>
<td>Spreadsheet, such as Microsoft Excel</td>
</tr>
<tr>
<td>Statistical</td>
<td>Provides summary statistics, trend projections, hypothesis testing, and more</td>
<td>Statistical programs, such as SPSS or SAS</td>
</tr>
<tr>
<td>Graphical</td>
<td>Assists decision makers in designing, developing, and using graphic displays of data and information</td>
<td>Graphics programs, such as Microsoft PowerPoint</td>
</tr>
<tr>
<td>Project Management</td>
<td>Handles and coordinates large projects; also used to identify critical activities and tasks that could delay or jeopardize an entire project if they are not completed in a timely and cost-effective fashion</td>
<td>Project management software, such as Microsoft Project</td>
</tr>
</tbody>
</table>
The User Interface or Dialogue Manager

- Allows users to interact with the DSS to obtain information
- Assists with all aspects of communications between user and hardware and software that constitute the DSS
Group Support Systems

• Group support system (GSS):
  – Also known as group decision support system and computerized collaborative work system
  – Consists of most elements in a DSS, plus software to provide effective support in group decision making
  – Also called group decision support system or computerized collaborative work system
**FIGURE 6.18**

**Configuration of a GSS**

A GSS contains most of the elements found in a DSS, plus software to facilitate group member communications.
Characteristics of a GSS That Enhance Decision Making

• Special design
• Ease of use
• Flexibility
• Decision-making support:
  – Delphi approach
  – Brainstorming
  – Group consensus approach
  – Nominal group technique
Characteristics of a GSS That Enhance Decision Making (continued)

• Anonymous input
• Reduction of negative group behavior
• Parallel and unified communication
• Automated record keeping
GSS Hardware and Software Tools

• GSS hardware includes computers, laptops, tablet computers, smartphones, and other devices

• Advanced video devices
GSS Hardware and Software Tools (continued)

• GSS software often called groupware or workgroup software
• Helps with joint work group scheduling, communication, and management
• GSS software packages:
  – Lotus Notes
  – Office Communicator
  – Sharepoint
  – WebOffice
  – BaseCamp
GSS Hardware and Software Tools (continued)

• GSSs use a number of tools, including:
  – E-mail, instant messaging (IM), and text messaging (TM)
  – Videoconferencing
  – Group scheduling
  – Project management
  – Document sharing
GSS Alternatives

• Decision room:
  – Decision makers are located in the same building or geographic area
  – Combines face-to-face verbal interaction with technology

• Local area decision network:
  – Group members are located in the same building or geographic area under conditions where group decision making is frequent
GSS Alternatives (continued)

**FIGURE 6.20**

**GSS decision room**

For group members who are in the same location, the decision room is an optimal GSS alternative. This approach can use both face-to-face and computer-mediated communication. By using networked computers and computer devices, such as project screens and printers, the meeting leader can pose questions to the group, instantly collect members’ feedback, and, with the help of the governing software loaded on the control station, process this feedback into meaningful information to aid in the decision-making process.
GSS Alternatives (continued)

• Teleconferencing:
  – Decision frequency is low
  – Location of group members is distant

• Wide area decision network:
  – Decision frequency is high
  – Location of group members is distant
Executive Support Systems

• Executive support system (ESS):
  – Specialized DSS
  – Includes hardware, software, data, procedures, and people used to assist senior-level executives
  – Also called an executive information system (EIS)
Executive Support Systems (continued)

FIGURE 6.21
Layers of executive decision making
Executive Support Systems in Perspective

• ESS is special type of DSS
  – DSS provides variety of modeling and analysis tools to enable users to answer questions
  – ESS presents structured information about aspects of the organization that executives consider important
Capabilities of Executive Support Systems

- ESS provides support for:
  - Defining overall vision
  - Strategic planning
  - Strategic organizing and staffing
  - Strategic control
  - Crisis management
Summary

• Problem solving:
  – Begins with decision making
  – Includes implementation and monitoring
  – Decision making is a component

• Management information system:
  – Integrated collection of people, procedures, databases, and devices

• Data that enters the MIS:
  – Originates from both internal and external sources
Summary (continued)

• Output of most MISs:
  – Scheduled reports, key-indicator reports
  – Demand reports, exception reports
  – Drill-down reports

• Primary sources of input to functional MISs:
  – Corporate strategic plan
  – Data from the ERP system and TPS
  – Information from supply chain and business transactions
  – External sources including the Internet and extranets
Summary (continued)

• Components of a DSS:
  – The database, model base, extranets, networks
  – User interface or dialogue manager
  – Link to external databases, the Internet
  – The corporate intranet, extranets, networks

• Group support system (GSS):
  – Consists of most of the elements in a DSS, plus software to provide effective support in group decision-making settings
Summary (continued)

• Executive support systems (ESSs)
  – Specialized decision support systems designed to meet the needs of senior management
  – Typically easy to use, offer a wide range of computer resources, and handle a variety of internal and external data