COURSE TECHNOLOGY
CENGAGE Learning™

Fundamentals of Information Systems, Fifth 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 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 the use of other special purpose systems

Decision Making and Problem Solving

- Strategic planning and the overall goals of the organization
  - Set the course for decision making, helping employees and business units achieve their objectives and goals

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
  - **Choice stage:** Select a course of action

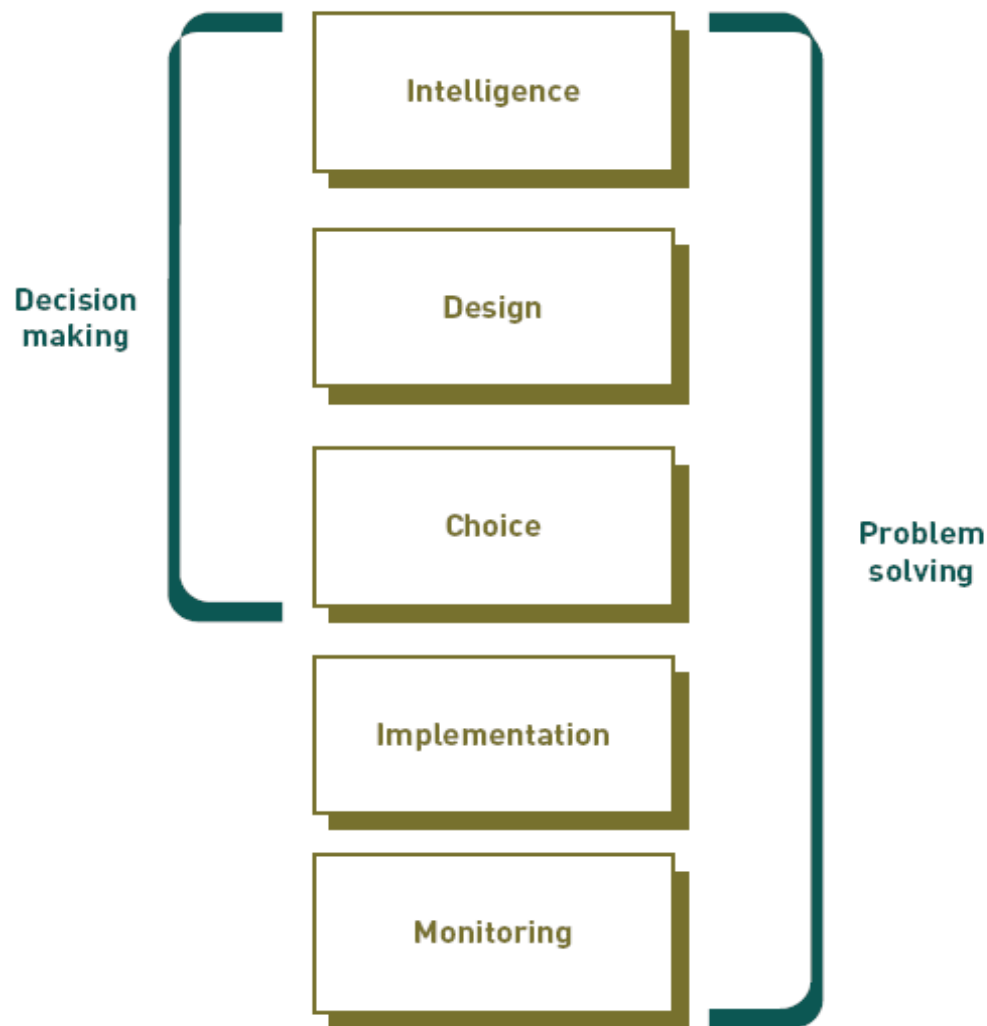# Decision Making as a Component of Problem Solving (continue)

Intelligence

Design

Choice

Implementation

Monitoring

Decision making

Problem solving

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
  - Goes beyond decision making to include the implementation stage

- Implementation stage
  - Solution is put into effect

- Monitoring stage
  - Decision makers evaluate the implementation

Programmed Versus Nonprogrammed Decisions

- Programmed decision
  - Decision made using a rule, procedure, or quantitative method
  - Easy to computerize using traditional information systems

- Nonprogrammed decisions
  - Deals 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
  - Find 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

- Performance of these systems is:
  - Typically a function of decision quality and problem complexity

- Decision quality can result in:
  - Increased effectiveness
  - Increased efficiency
  - Higher productivity

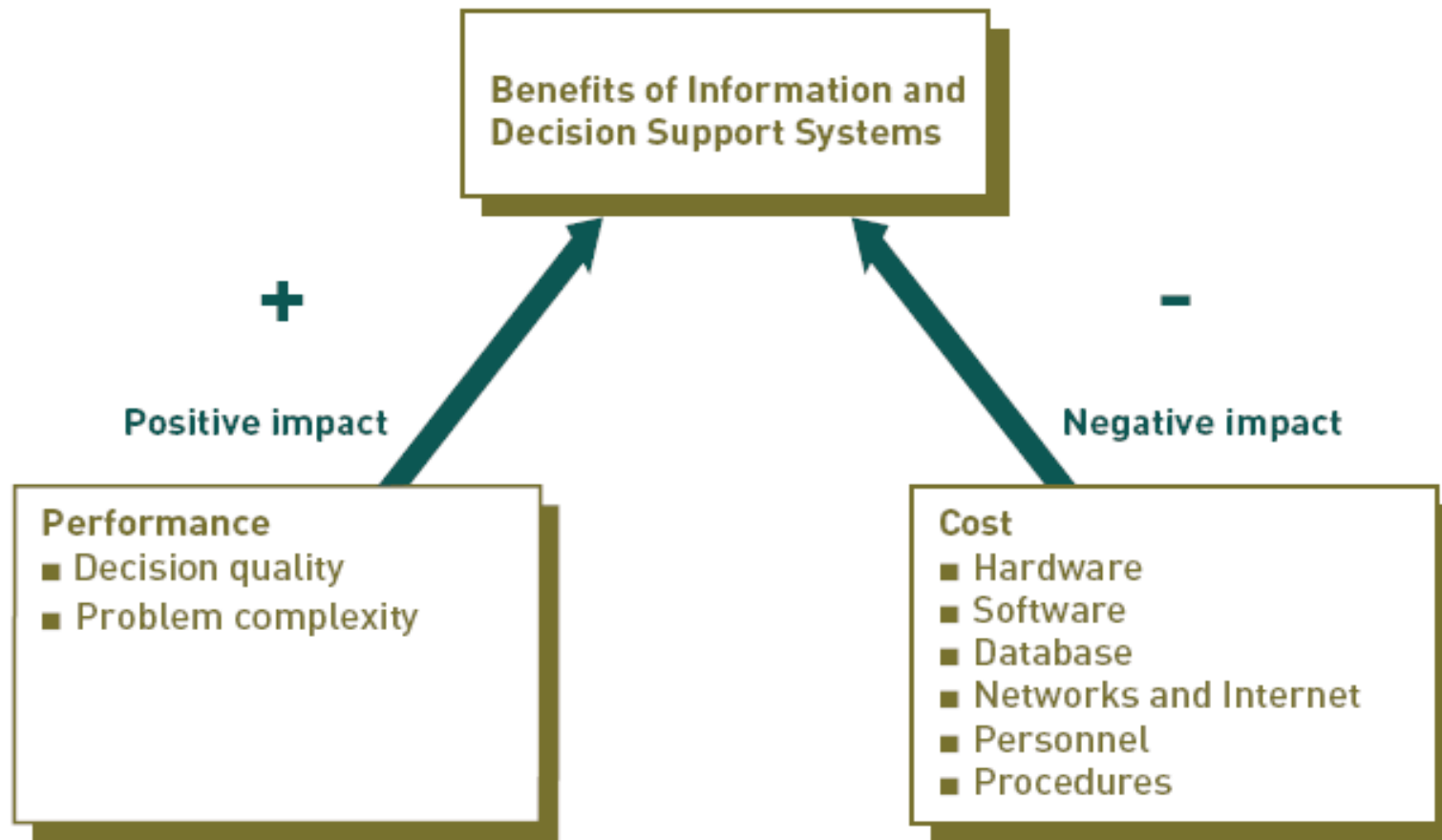# The Benefits of Information and Decision Support Systems (continued)

Benefits of Information and Decision Support Systems

+

Positive impact

−

Negative impact

Performance
- Decision quality
- Problem complexity

Cost
- Hardware
- Software
- Database
- Networks and Internet
- Personnel
- Procedures

Figure 6.3

The Benefits of Information and Decision Support Systems

An Overview of Management Information Systems

- Management information system (MIS)
  - Integrated collection of people, procedures, databases, and devices
  - Provides managers and decision makers with information to help achieve organizational goals
  - Can give companies a competitive advantage

Management Information Systems in Perspective

- MIS provides managers with information that supports effective decision making and provides feedback on daily operations

- Use of MISs spans all levels of management

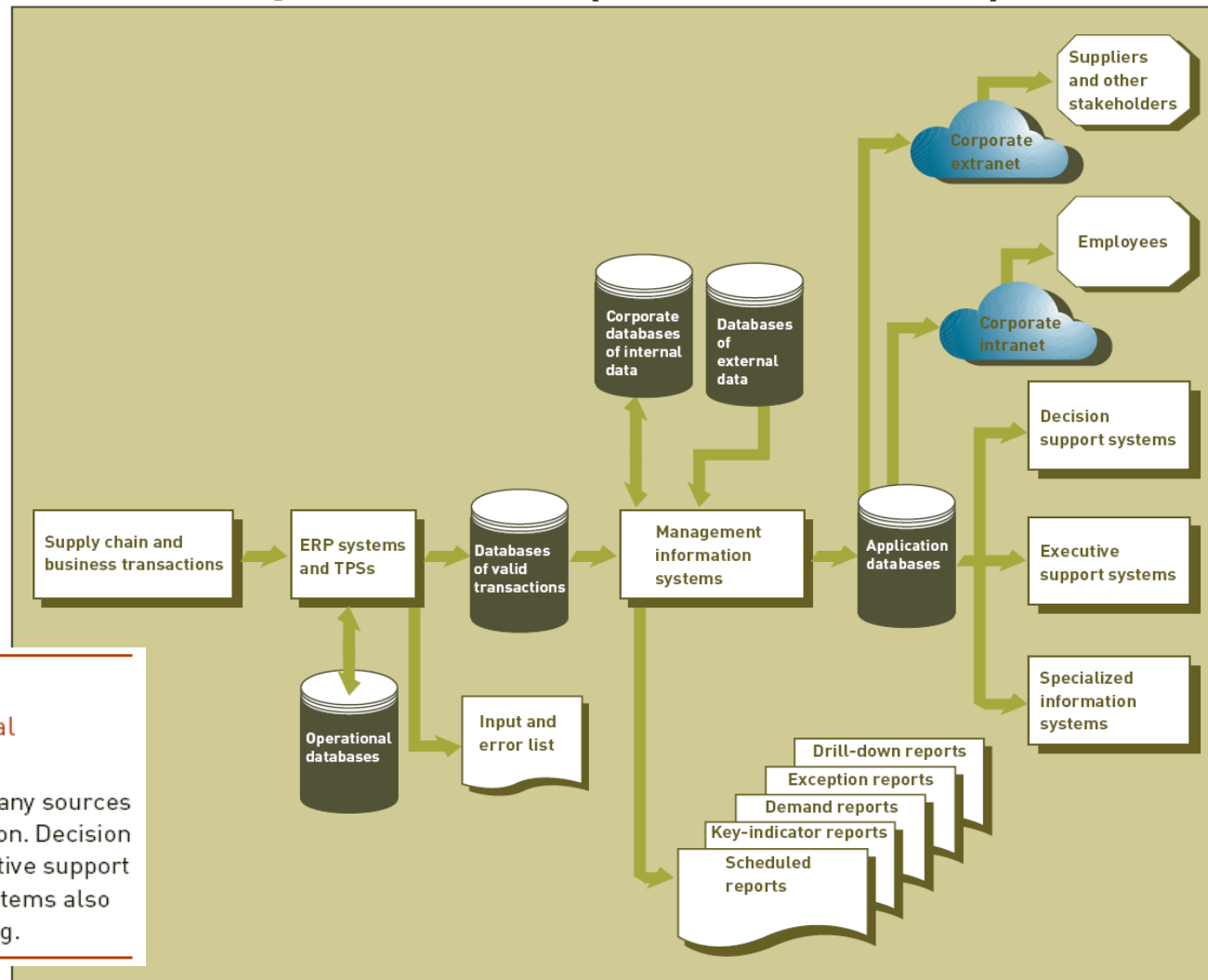# Management Information Systems in Perspective (continued)

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
  - TPSs 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
  - The Internet
  - Extranets

Outputs of a Management Information System

- Scheduled reports
  - Produced periodically, or on a schedule
- Key-indicator report
  - Summary of previous day's critical activities
- Demand reports
  - Developed to give certain information upon request
- Exception reports
  - Automatically produced when a situation is unusual or requires management action
- 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 the computer system
  - Allow users to develop their own custom reports
  - Require user requests for reports developed by systems personnel

Functional Aspects of the MIS

- Most organizations are structured along functional lines or areas

- MIS can be divided along functional lines to produce reports tailored to individual functions
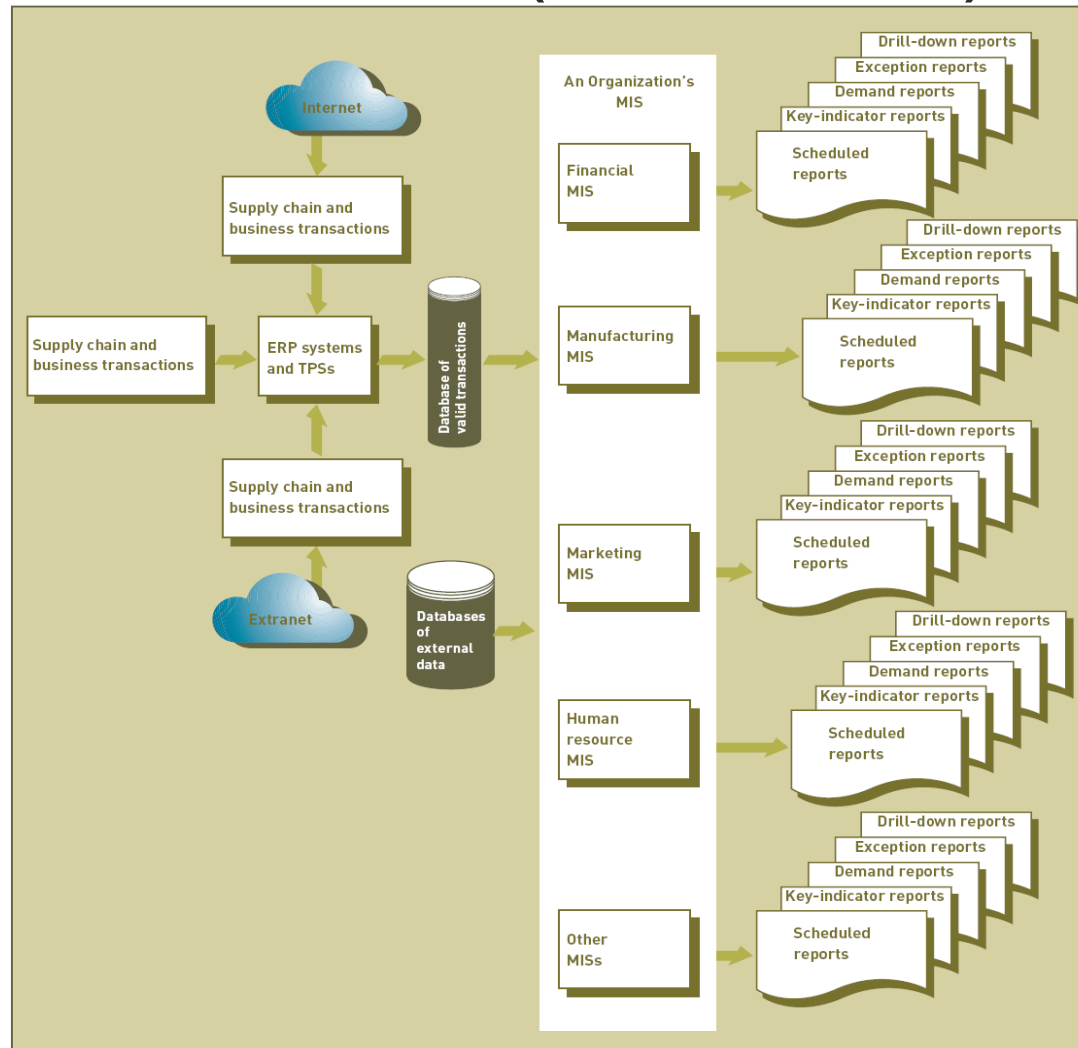
Functional Aspects of the MIS (continued)

Figure 6.7

An Organization's MIS

The MIS is an integrated collection of functional information systems, each supporting particular functional areas.

Financial Management Information Systems

- Financial MIS
  - Provides financial information
- Functions of a financial MIS include:
  - Integrate financial and operational information from multiple sources
  - Provide easy access to data for both financial and nonfinancial users
  - Make financial data immediately available
  - Analyze historical and current financial activity
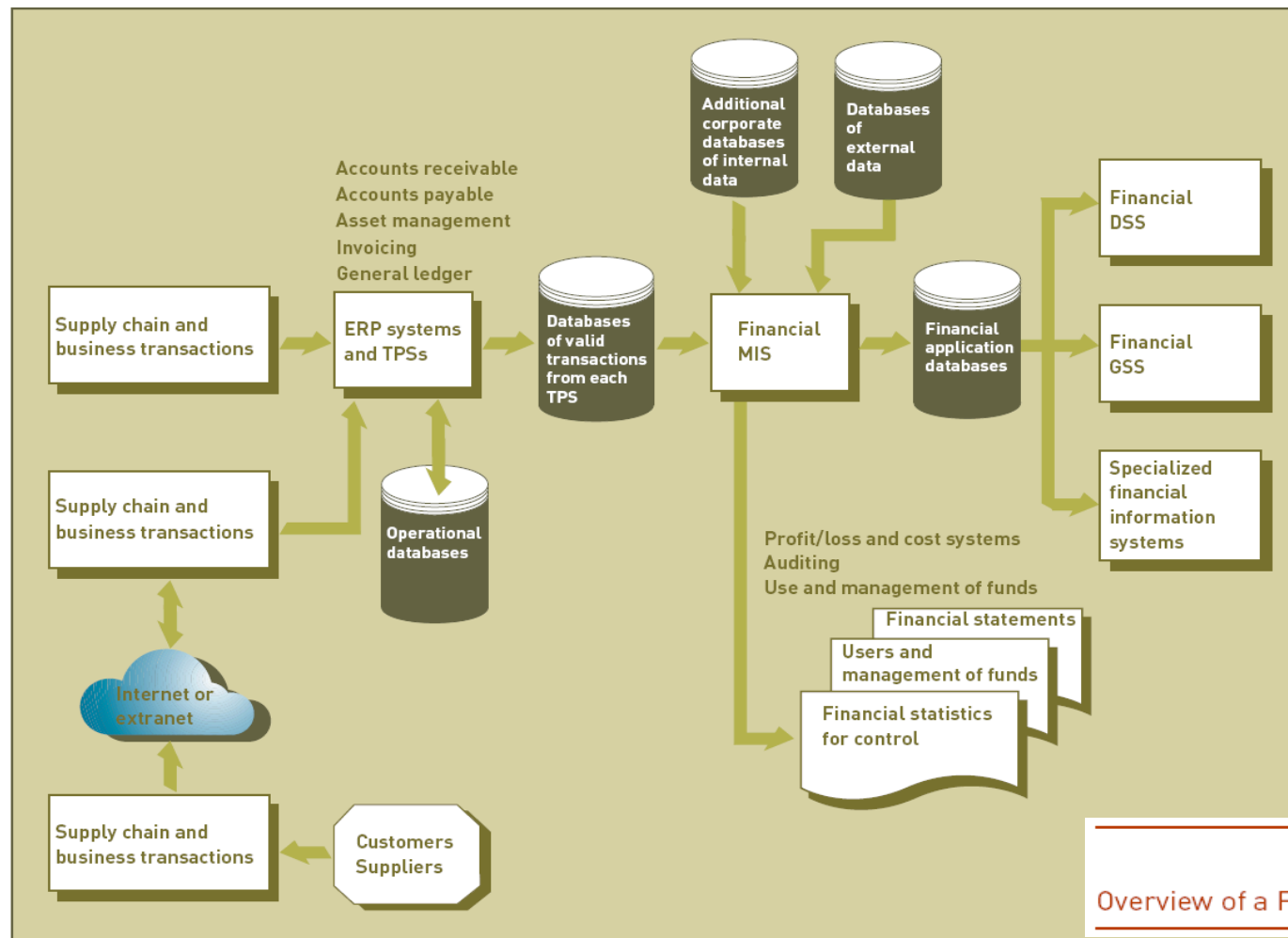
Financial Management Information Systems (continued)

Figure 6.8

Overview of a Financial MIS

Manufacturing Management Information Systems

- Manufacturing MIS subsystems and outputs
  - 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 and inventory control
  - Process control
  - Quality control and testing

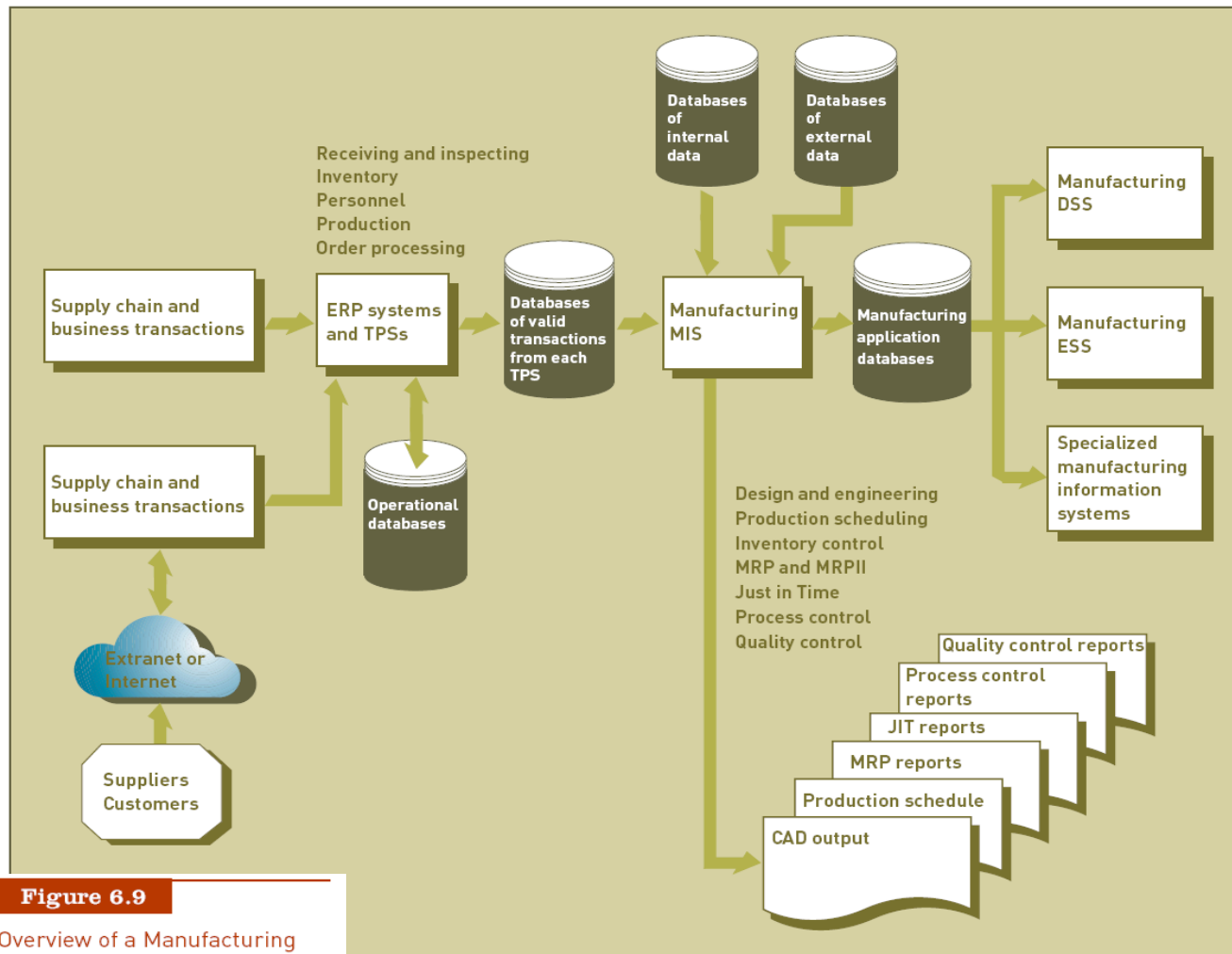# Manufacturing Management Information Systems (continued)

Figure 6.9

Overview of a Manufacturing MIS

Marketing Management Information Systems

- Supports managerial activities in:
  - Product development, distribution, pricing decisions, promotional effectiveness, and sales forecasting
- Subsystems include:
  - Marketing research
  - Product development
  - Promotion and advertising
  - Product pricing

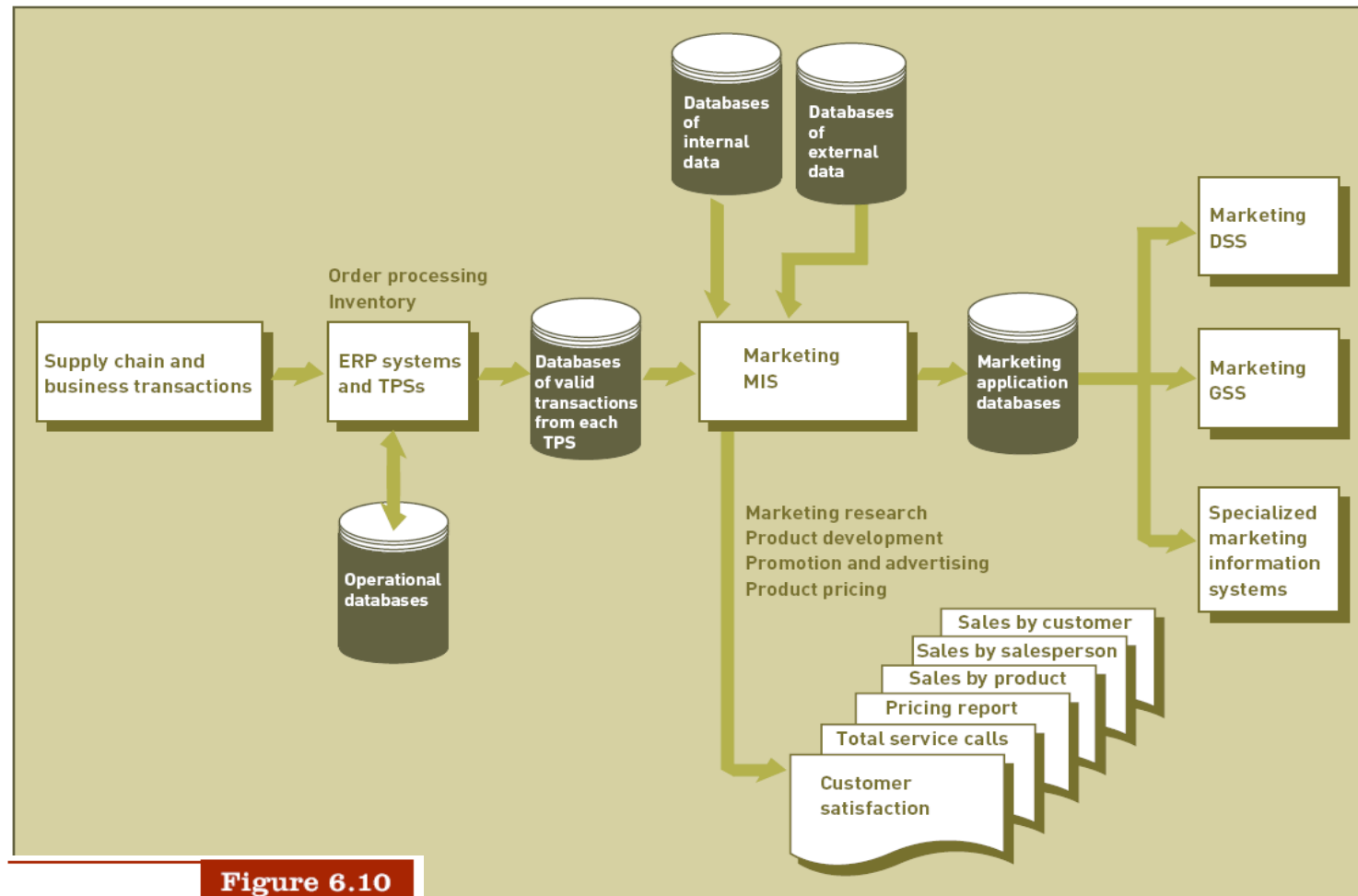# Marketing Management Information Systems (continued)

Figure 6.10

Overview of a Marketing MIS

Human Resource Management Information Systems

- Concerned with activities related to employees and potential employees of an organization
- Outputs include:
  - Human resource planning
  - Personnel selection and recruiting
  - Training and skills inventory
  - Scheduling and job placement
  - Wage and salary administration
  - Outplacement

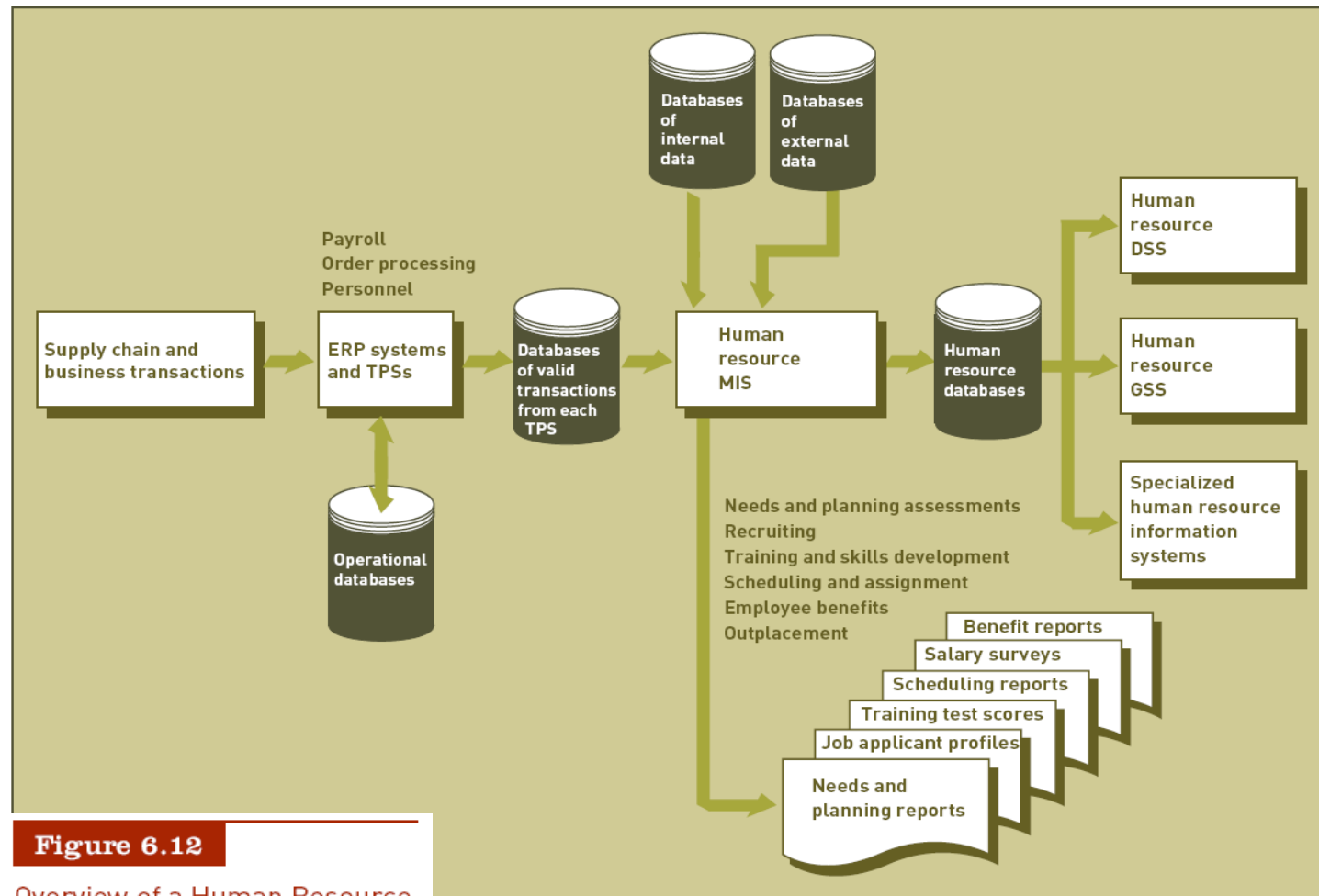# Human Resource Management Information Systems (continued)

Figure 6.12

Overview of a Human Resource MIS

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 geographic information
    - Data identified according to its location

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 is on decision-making effectiveness when faced with unstructured or semistructured business problems

Capabilities of a Decision Support System

- Support for problem-solving phases
- Support for different decision frequencies
  - Ad-hoc DSS, institutional DSS
- Support for different problem structures
  - Highly structured, semistructured, or unstructured
- Support for various decision-making levels
  - Operational, tactical, strategic

Capabilities of a Decision Support System (continued)

Company or Application	Description
ING Direct	The financial services company uses a DSS to summarize the bank's financial performance. The bank needed a measurement and tracking mechanism to determine how successful it was and to make modifications to plans in real time.
Cinergy Corporation	The electric utility developed a DSS to reduce lead time and effort required to make decisions in purchasing coal.
U.S. Army	It developed a DSS to help recruit, train, and educate enlisted forces. The DSS uses a simulation that incorporates what-if features.
National Audubon Society	It developed a DSS called Energy Plan (EPLAN) to analyze the impact of U.S. energy policy on the environment.
Hewlett-Packard	The computer company developed a DSS called Quality Decision Management to help improve the quality of its products and services.
State of Virginia	The State of Virginia developed the Transportation Evacuation Decision Support System (TEDSS) to determine the best way to evacuate people in case of a nuclear disaster at its nuclear power plants.

Table 6.1

Selected DSS Applications

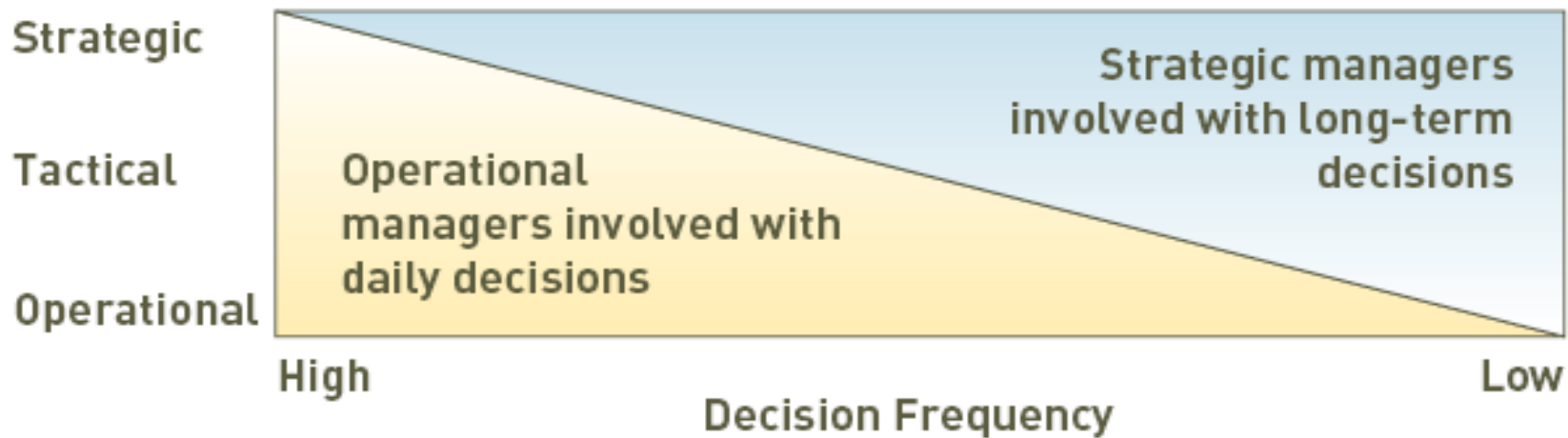# Capabilities of a Decision Support System (continued)

Figure 6.14

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:
    - 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

Components of a Decision Support System

- Database and a model base
  - Core of a DSS

- Dialogue manager
  - Allows decision makers to easily access and manipulate the DSS

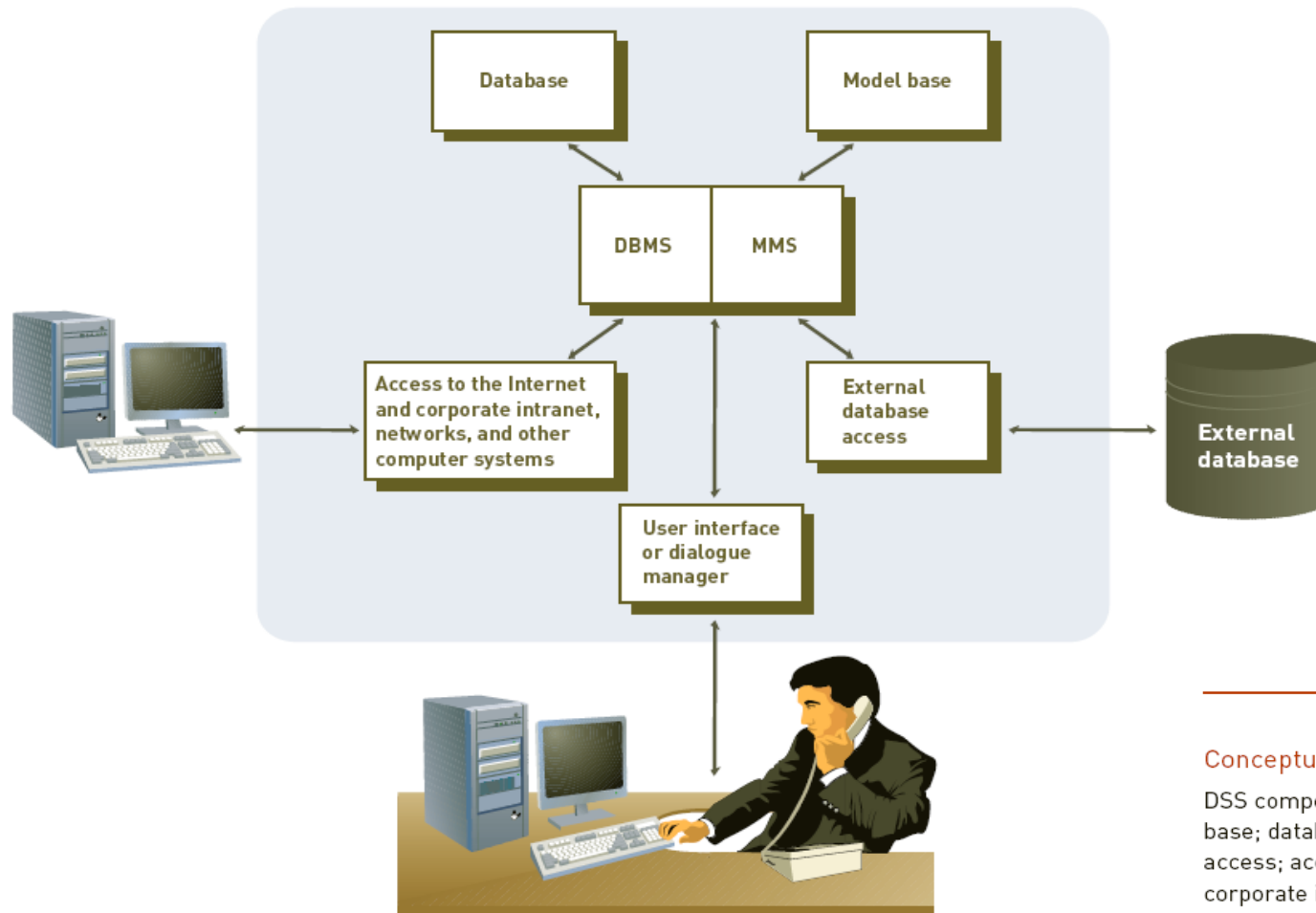# Components of a Decision Support System (continued)

Figure 6.15

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.

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The Database

- ## Data-driven DSS
  - Performs qualitative analysis based on the company's databases
  - Taps into vast stores of information contained in the corporate database, retrieving information on inventory, sales, personnel, production, finance, accounting, and other areas
  - Often uses 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 management software
  - Can coordinate the use of models in a DSS

The Model Base (continued)

Model Type	Description	Software
Financial	Provides cash flow, internal rate of return, and other investment analysis	Spreadsheet, such as Microsoft Excel
Statistical	Provides summary statistics, trend projections, hypothesis testing, and more	Statistical programs, such as SPSS or SAS
Graphical	Assists decision makers in designing, developing, and using graphic displays of data and information	Graphics programs, such as Microsoft PowerPoint
Project Management	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	Project management software, such as Microsoft Project

Table 6.3

Model Management Software

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

The User Interface or Dialogue Manager

- Allows users to interact with the DSS to obtain information

- Assists with all aspects of communications between the user and the hardware and software that constitute the DSS

Group Support Systems

- 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*
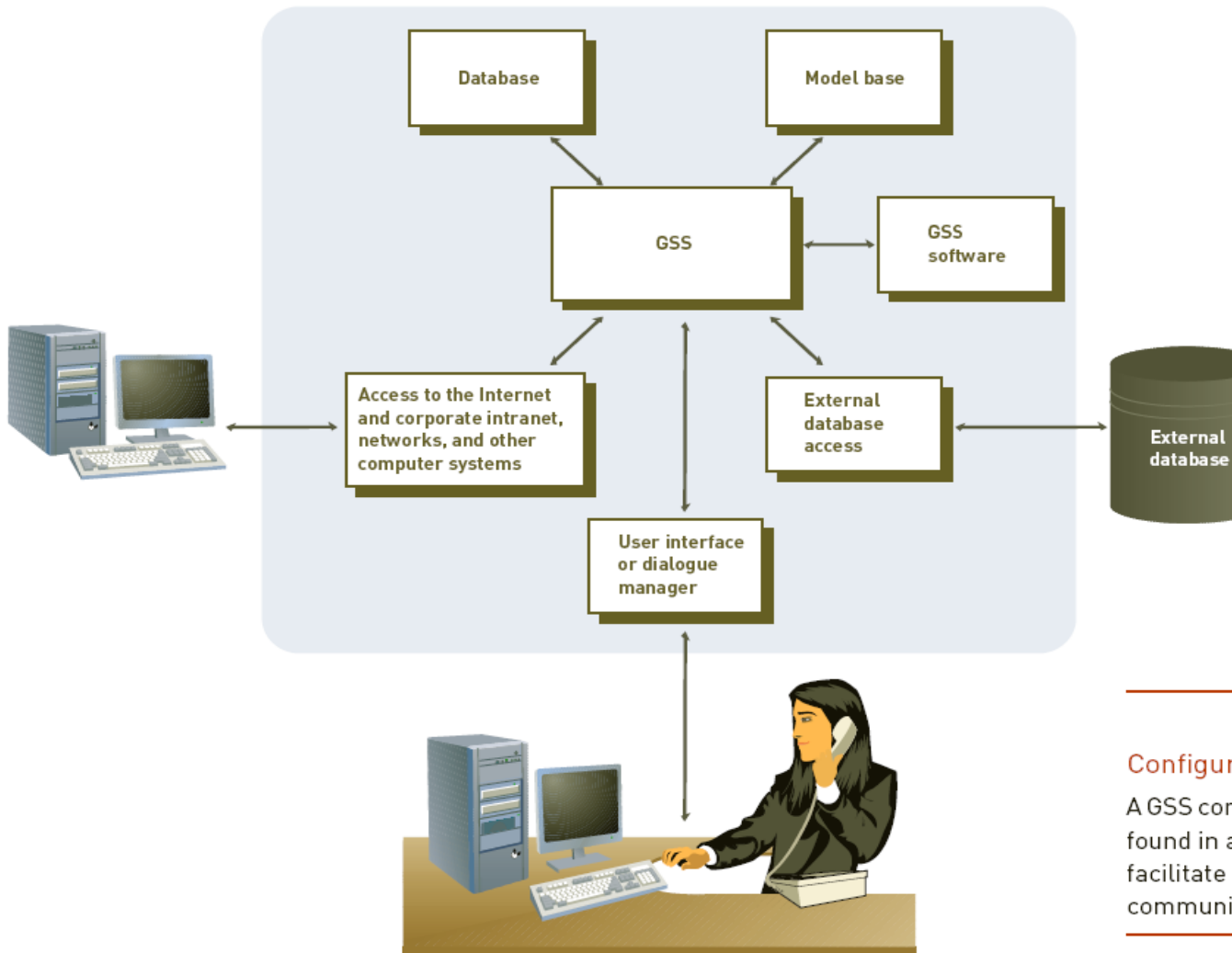
Group Support Systems (continued)

Figure 6.16

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
  - Procedures, devices, and approaches for creative thinking and effective communication
- Ease of use
  - Complex systems will seldom be used by groups
- Flexibility
  - Takes different decision-making styles and preferences into account
- Decision-making support for different approaches
  - Delphi, brainstorming, group consensus, nominal group technique

Characteristics of a GSS That Enhance Decision Making (continued)

- Anonymous input

  - Helpful in ranking performance of managers

- Reduction of negative group behavior

  - Avoids dominance of one member

- Unified communication

  - Integrates different communication systems

- Automated record keeping

  - Detailed records of meetings are automatically generated

GSS Software

- Helps with joint work group scheduling, communication, and management
- Software from Autodesk
  - Has GSS capabilities that allow groups to work together on design

GSS Alternatives

- Decision room

- Local area decision network

- Teleconferencing

- Wide area decision network
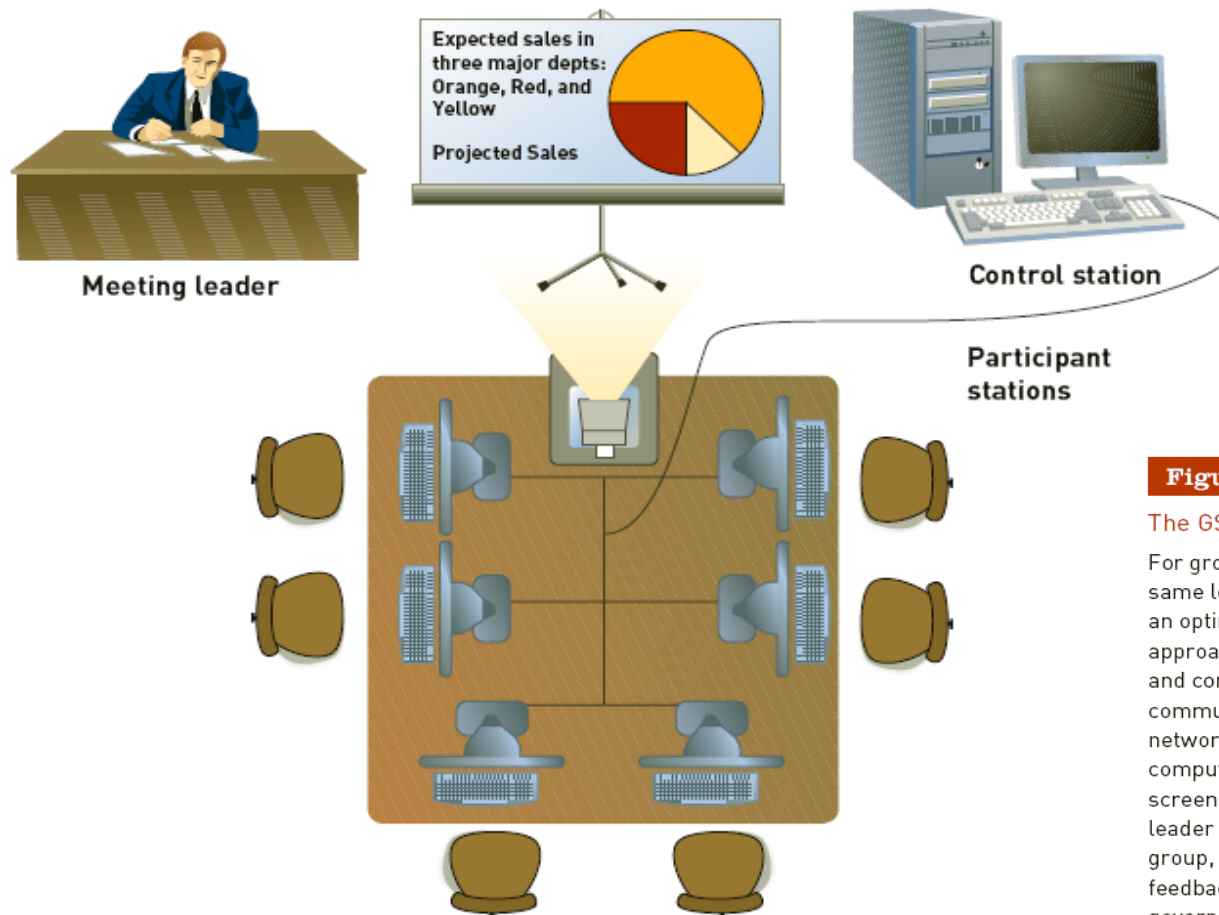
GSS Alternatives (continued)

Figure 6.18

The 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 their 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.

Executive Support Systems

- Specialized DSS that includes:

  - All hardware, software, data, procedures, and people used to assist senior-level executives within the organization

- Can be used by individuals at middle levels in the organizational structure
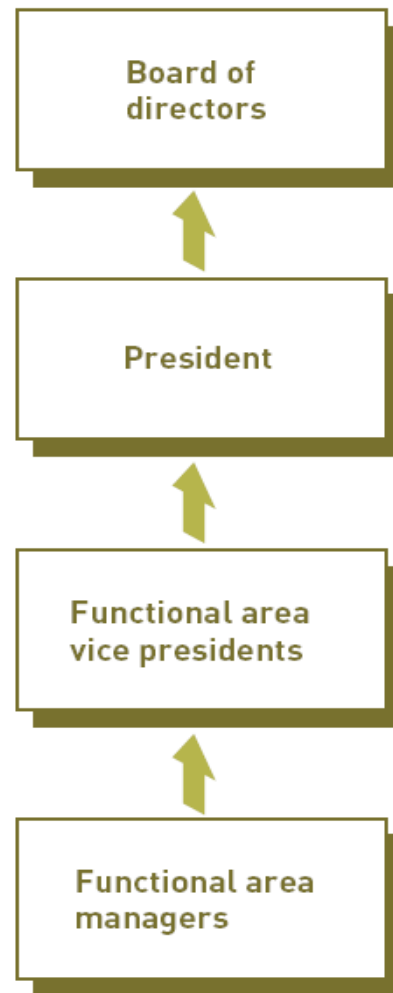
Executive Support Systems (continued)

Board of directors

President

Functional area vice presidents

Functional area managers

Figure 6.19

The Layers of Executive Decision Making

Executive Support Systems in Perspective

- Characteristics of an ESS:
  - Tailored to individual executives
  - Easy to use
  - Drill-down abilities
  - Support need for external data
  - Can help when uncertainty is high
  - Future-oriented
  - Linked with value-added business processes

Capabilities of Executive Support Systems

- Support for defining an overall vision
- Support for strategic planning
- Support for strategic organizing and staffing
- Support for strategic control
- Support for crisis management

Summary

- Decision-making phase of the problem-solving process

  – Intelligence, design, and choice

- Management information system (MIS)

  – Integrated collection of people, procedures, databases, and devices

- Financial MIS

  – Provides financial information to all financial managers within an organization

Summary (continued)

- **Manufacturing MIS**

  – Accepts inputs from the strategic plan, the ERP system and TPS, and external sources

- **Marketing MIS**

  – Supports managerial activities in product development, distribution, and pricing decisions

- **Human resource MIS**

  – Concerned with activities related to employees of the organization

Summary (continued)

- Decision support system (DSS)
  - Organized collection of people, procedures, software, databases, and devices

- Group support system (GSS)
  - Includes elements in a DSS, plus software to provide effective support in group decision making

- Executive support system (ESS)
  - Specialized decision support systems designed to meet the needs of senior management