DECISION SUPPORT SYSTEMS

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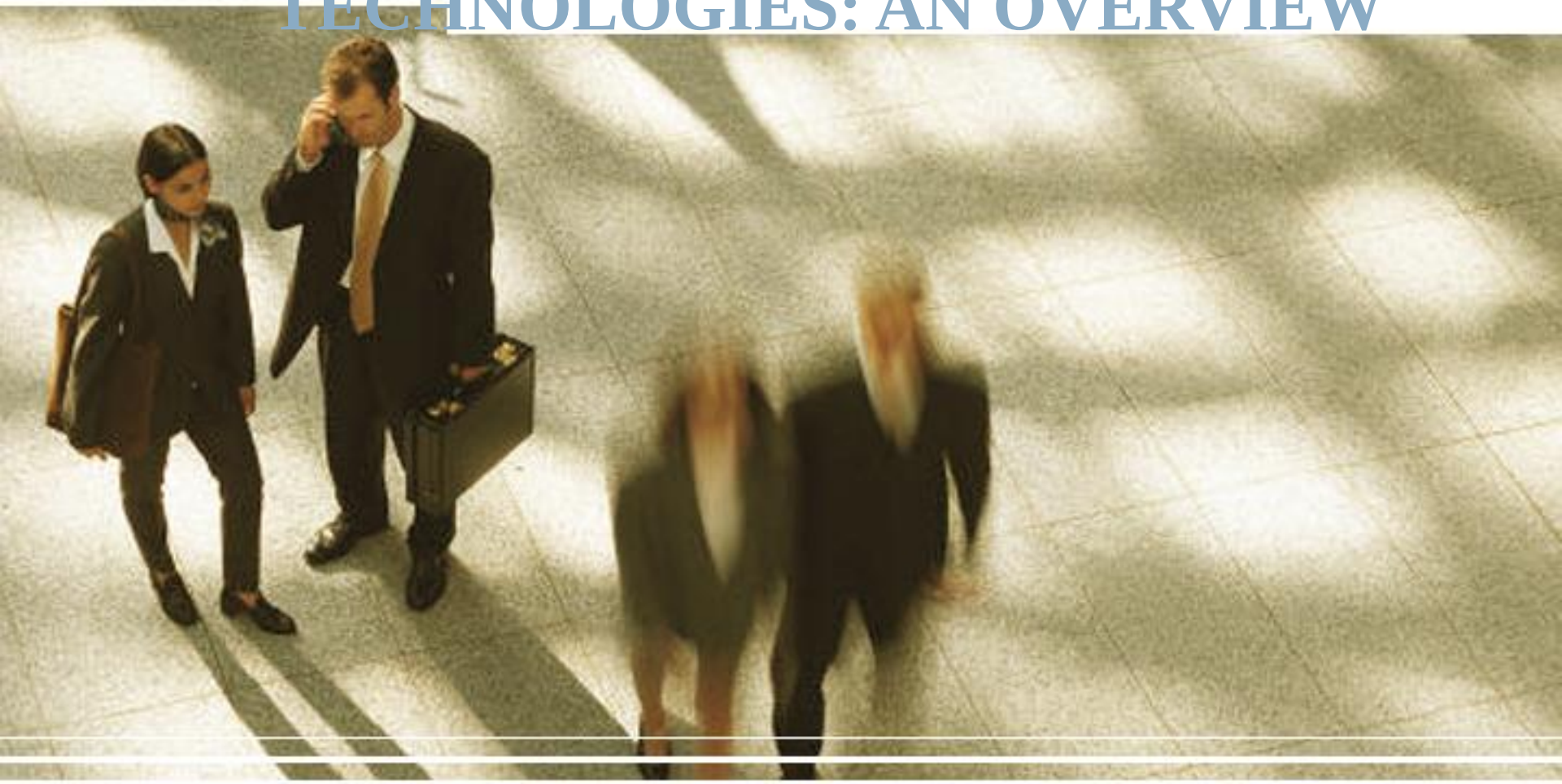
Chapter 3

DECISION SUPPORT SYSTEMS CONCEPTS, METHODOLOGIES, AND TECHNOLOGIES: AN OVERVIEW



Learning Objectives

- Understand possible decision support system (DSS) configurations
- Describe DSS characteristics and capabilities
- Understand the essential definition of DSS
- Understand DSS components and how they integrate
- Describe the components and structure of each DSS component: the data management subsystem, the model management subsystem, the user interface (dialog) subsystem, the knowledge-based management subsystem, and the user
- Explain Internet impacts on DSS and vice versa

DSS Configurations

- Decision support can be provided in many different configurations
- These configurations depend on the nature of the management-decision situation and the specific technologies used for support
- These technologies are assembled from four basic components (each with several variations and are typically deployed over the Web)
  - *Data*
  - *Models*
  - *User interface*
  - *Knowledge (optional)*

DSS Description

- **DSS application**

  A DSS program built for a specific purpose (e.g., a scheduling system for a specific company)
- **Business intelligence (BI)**

  A conceptual framework for decision support. It combines architecture, databases (or data warehouses), analytical tools, and applications
- A DSS supports all phases of decision making and may include a knowledge component
- A DSS can be used by a single user on a PC or can be Web-based for use by many people at several locations

DSS Description

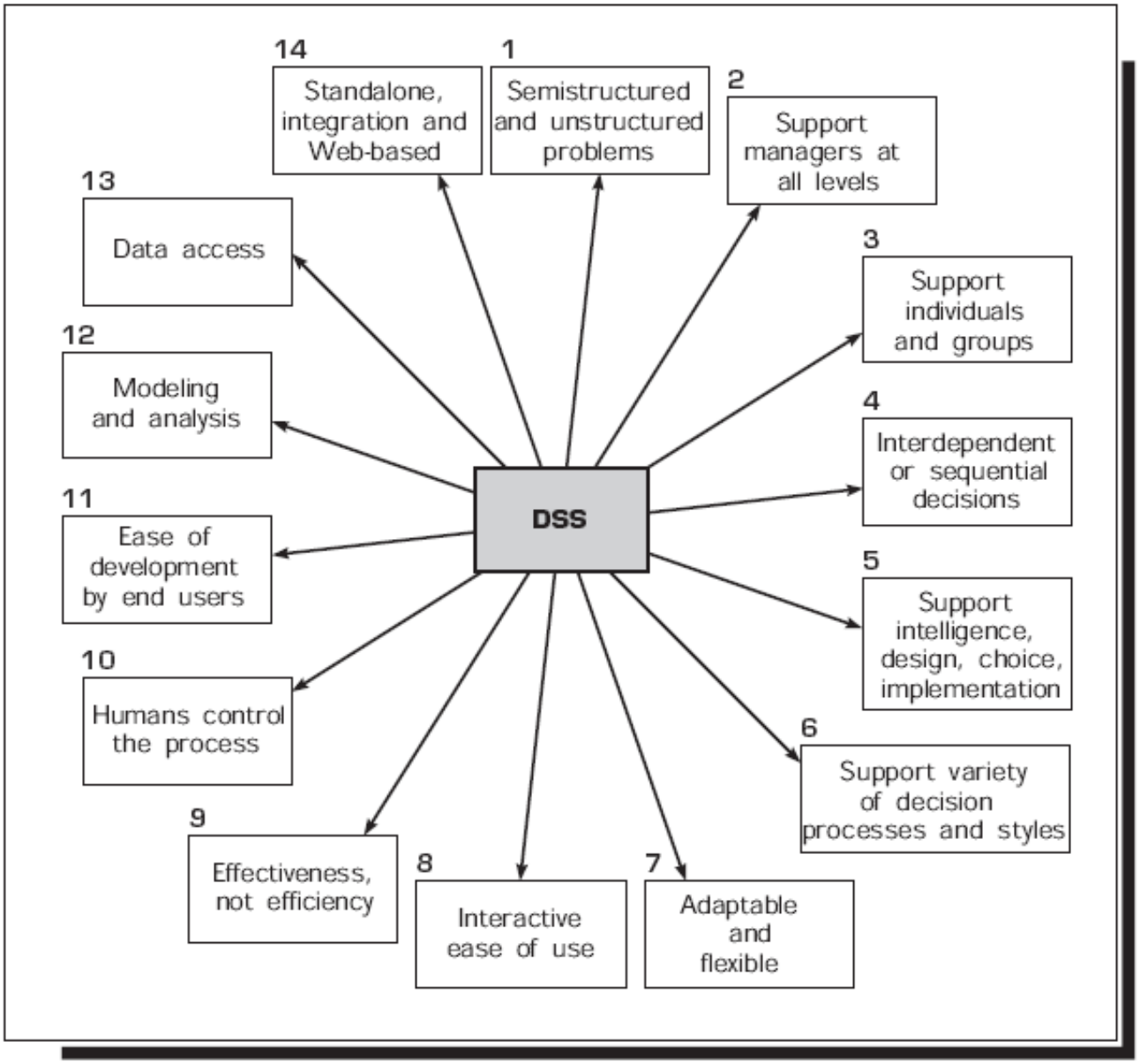


FIGURE 3.2 Key Characteristics and Capabilities of DSS

DSS Characteristics and Capabilities

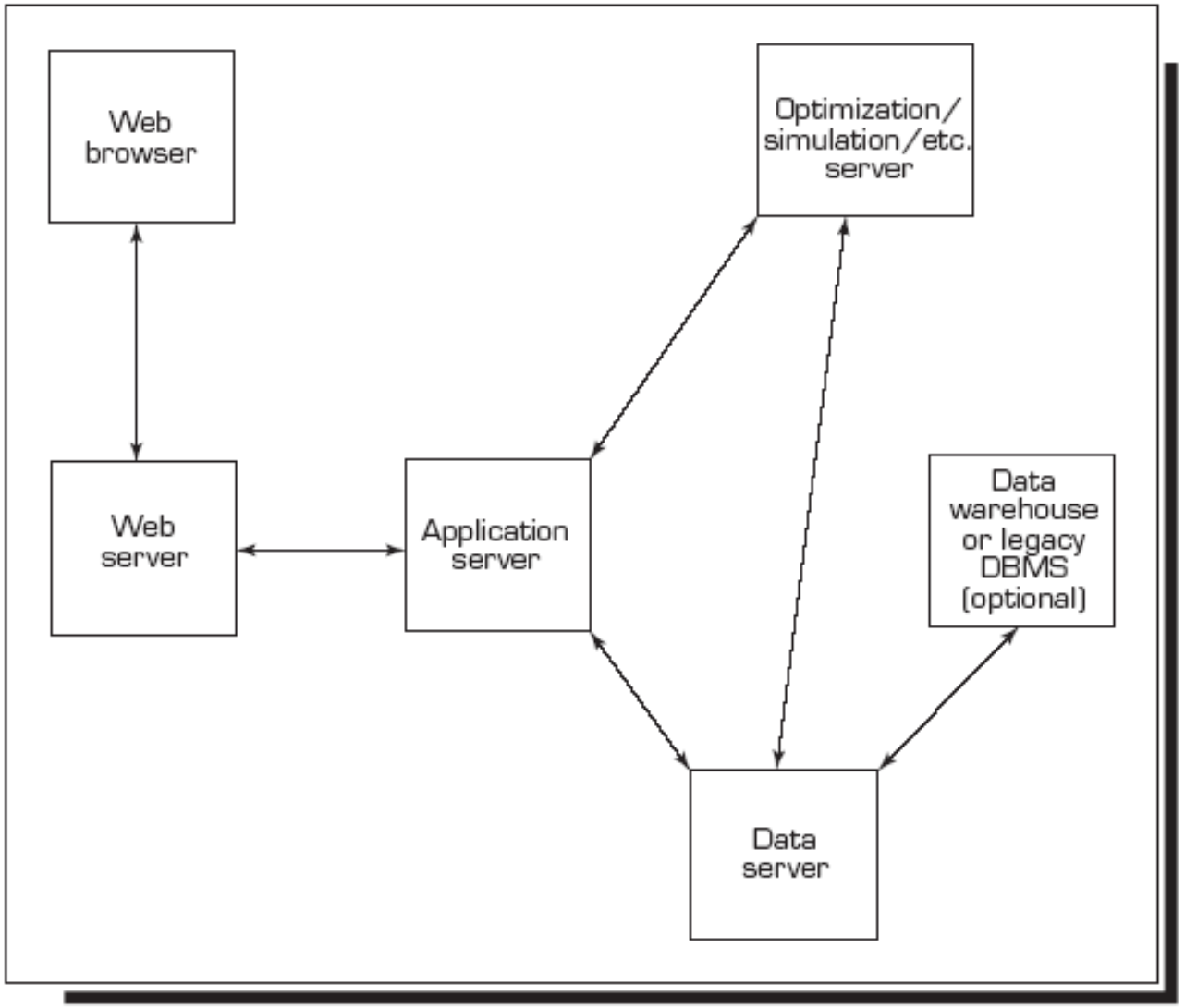


FIGURE 3.1 Multitiered Architecture for Incorporating Optimization, Simulation, and Other Models into Web-Based DSS

DSS Characteristics and Capabilities

- **Business analytics**

  The application of models directly to business data. Business analytics involves using DSS tools, especially models, in assisting decision makers.

- **Predictive analytics**

  A business analytical approach toward forecasting (e.g., demand, problems, opportunities) that is used instead of simply reporting data as they occur

DSS Characteristics and Capabilities

- The key characteristics and capabilities of DSS
  - *Support for decision makers, mainly in semistructured and unstructured situations, by bringing together human judgment and computerized information*
  - *Support for all managerial levels, ranging from top executives to line managers*
  - *Support for individuals as well as groups*
  - *Support for interdependent and/or sequential decisions*
  - *Support in all phases of the decision-making process*
  - *Support for a variety of decision-making processes and styles*
  - *DSS are flexible, so users can add, delete, combine, change, or rearrange basic elements; DSS can be readily modified to solve other, similar problems*

DSS Characteristics and Capabilities

- *User-friendliness, strong graphical capabilities, and a natural language interactive human–machine interface can greatly increase the effectiveness of DSS*
- *Improved effectiveness of decision making*
- *The decision maker has complete control over all steps of the decision-making process in solving a problem*
- *End users are able to develop and modify simple systems by themselves*
- *Models are generally utilized to analyze decision-making situations*
- *Access is provided to a variety of data sources, formats, and types*
- *Can be employed as a standalone tool used by an individual decision maker in one location or distributed throughout an organization and in several organizations along the supply chain*
- *Can be integrated with other DSS and/or applications, and it can be distributed internally and externally, using networking and Web technologies*

Components of DSS

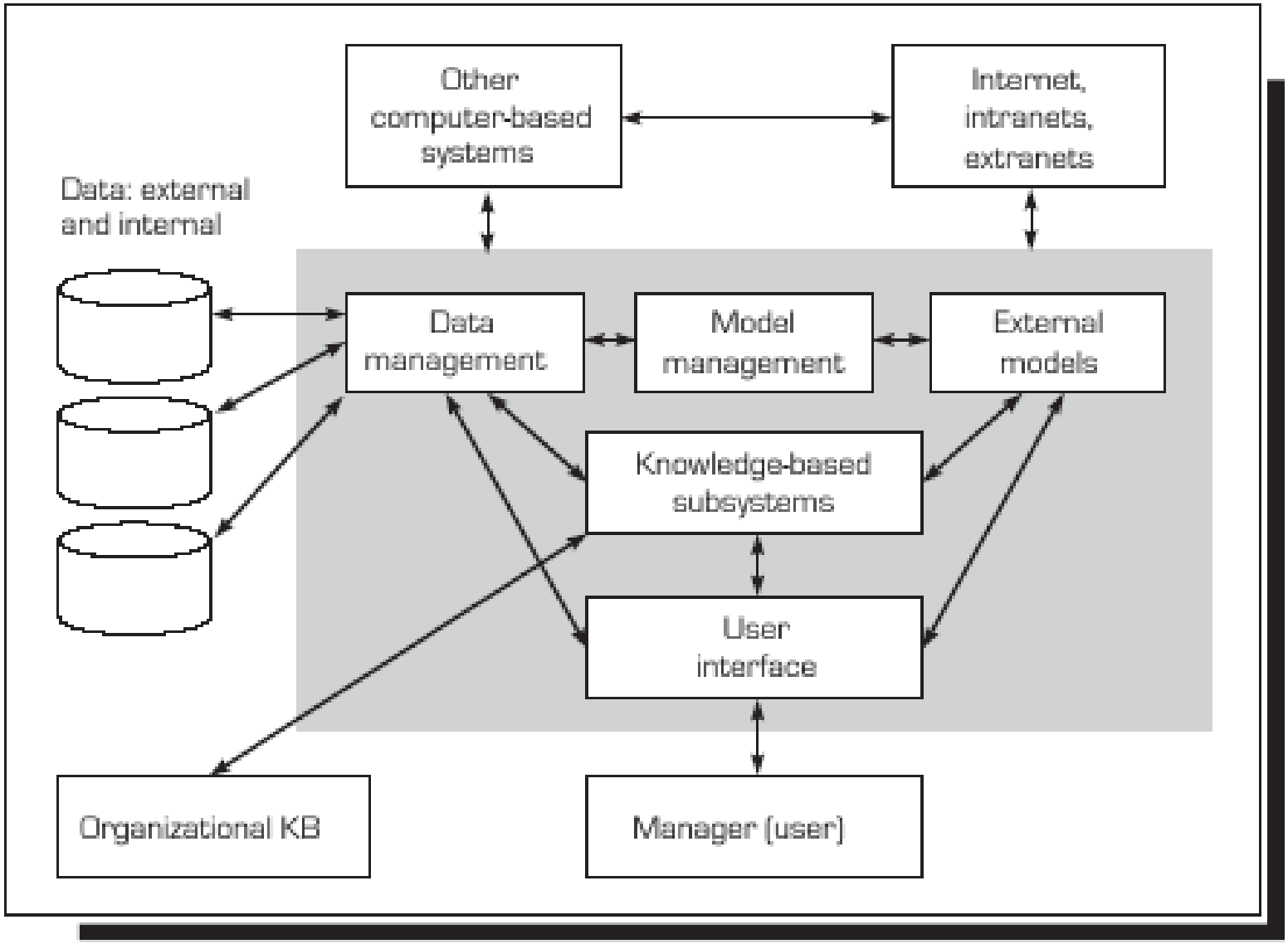


FIGURE 3.3 A Schematic View of DSS

Components of DSS

- **Database management system (DBMS)**

  Software for establishing, updating, and querying (e.g., managing) a database

- **Data warehouse**

  A physical repository where relational data are organized to provide clean, enterprise-wide data in a standardized format

- **Database**

  The organizing of files into related units that are then viewed as a single storage concept. The data in the database are generally made available to a wide range of users

Components of DSS

- **Model management subsystem**
  - ***Model base management system (MBMS)***

    Software for establishing, updating, combining, and so on (e.g., managing) a DSS model base
- **User interface**

The component of a computer system that allows bidirectional communication between the system and its user

Knowledge-based management subsystem

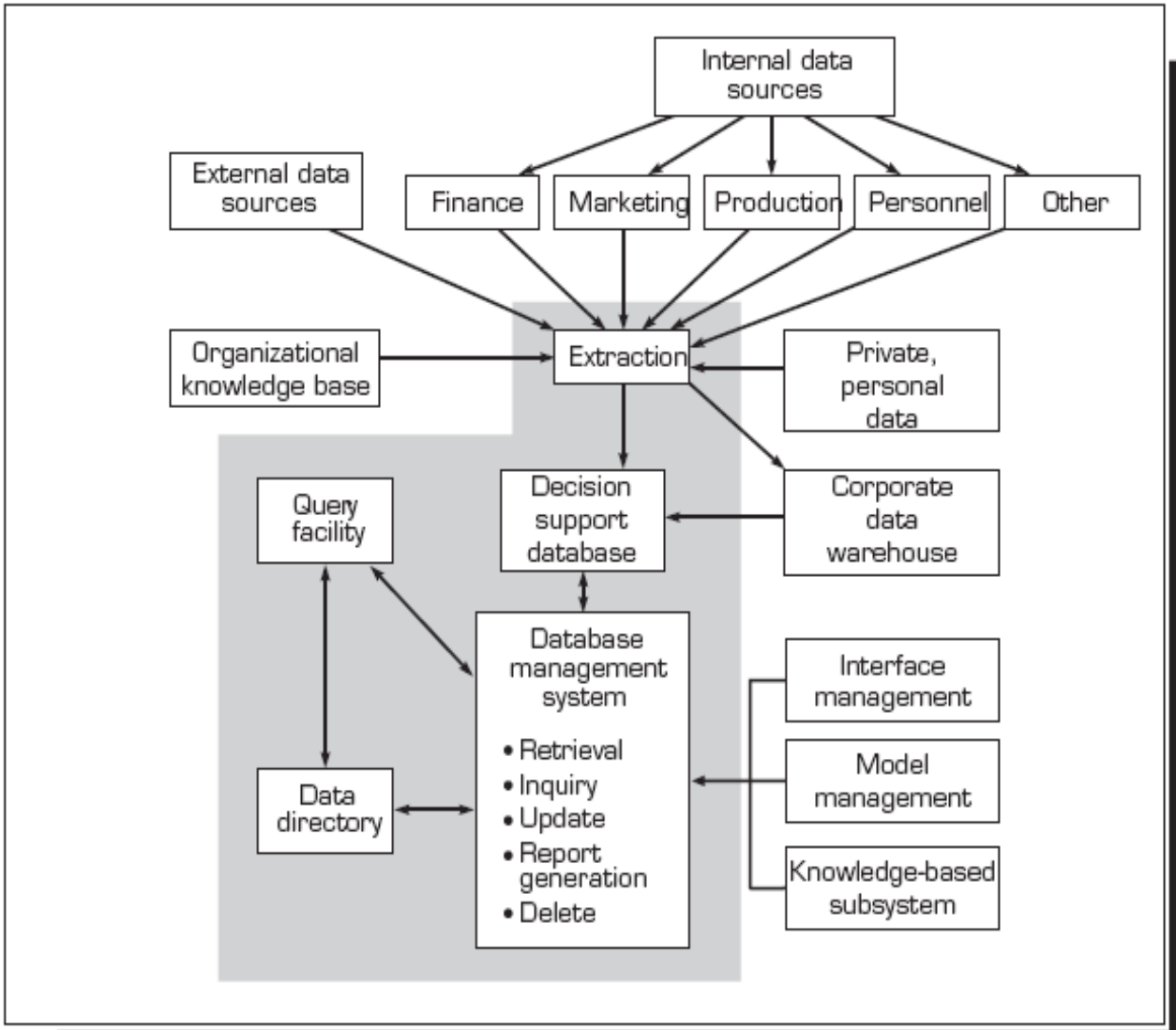
- *The knowledge-based management subsystem can support any of the other subsystems or act as an independent component*
- ***Organizational knowledge base***

  An organization's knowledge repository

Data Management Subsystem

- The data management subsystem is composed of"
  - *DSS database*
  - *DBMS*
  - *Data directory*
  - *Query facility*

FIGURE 3.5 The Structure of the Data Management Subsystem



Data Management Subsystem

- **The Database**
  - *Internal data come mainly from the organization's transaction processing system*
  - *External data include industry data, market research data, census data, regional employment data, government regulations, tax rate schedules, and national economic data*
  - *Private data can include guidelines used by specific decision makers and assessments of specific data and/or situations*
  - *Data organization*
  - ***Data extraction***

The process of capturing data from several sources, synthesizing them, summarizing them, determining which of them are relevant, and organizing them, resulting in their effective integration

Data Management Subsystem

- **Database management system (DBMS)**
- Software for establishing, updating, and querying (e.g., managing) a database
- **Query Facility**

  The (database) mechanism that accepts requests for data, accesses them, manipulates them, and queries them
- **Directory**

  A catalog of all the data in a database or all the models in a model base

Key database and database management system issues

- *Data quality*
- *Data integration*
- *Scalability*
- *Data security*

The Model Management Subsystem

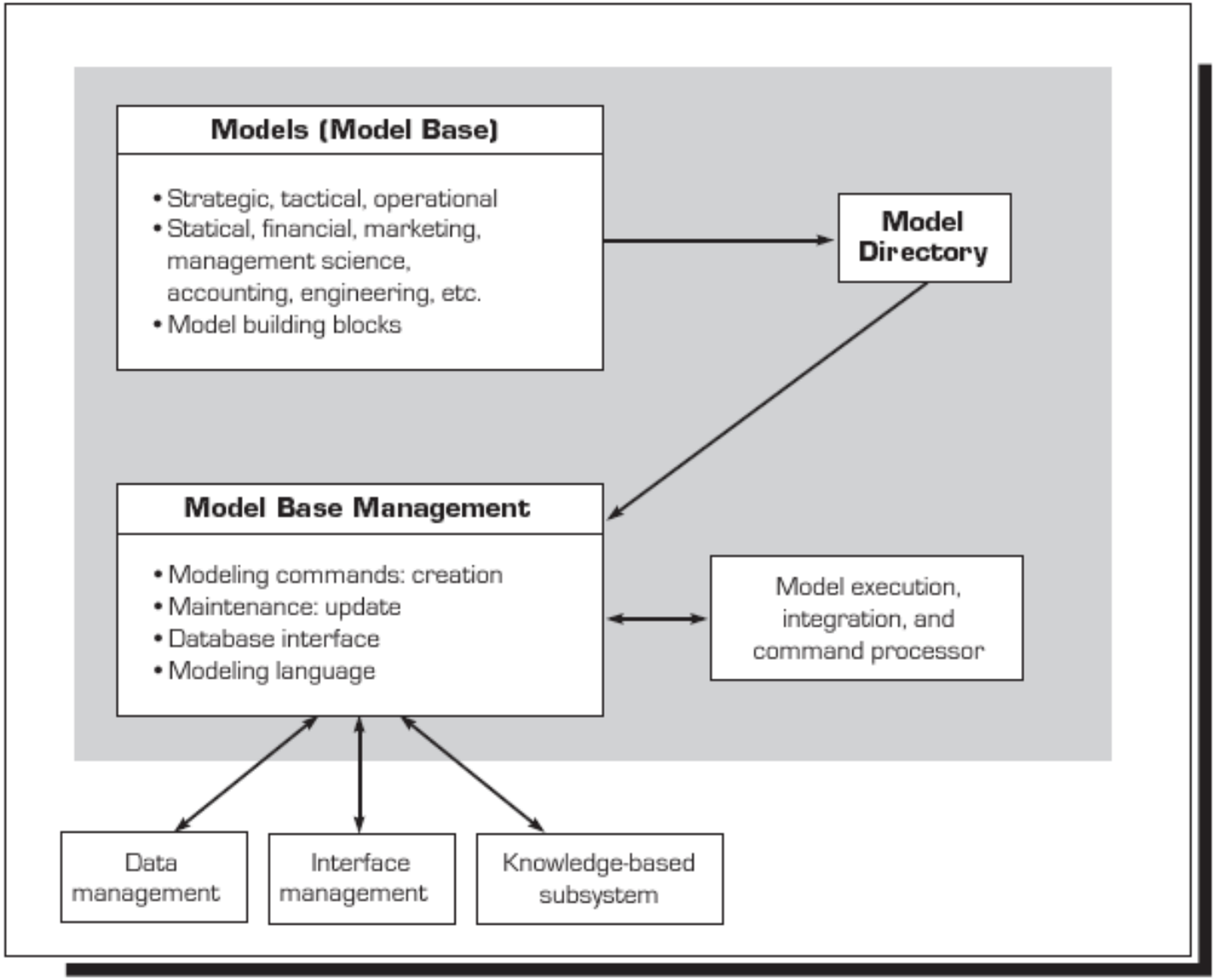


FIGURE 3.6 The Structure of the Model Management Subsystem

The Model Management Subsystem

- **Model base**

  A collection of preprogrammed quantitative models (e.g., statistical, financial, optimization) organized as a single unit

  Four categories of models with the model base
  - *Strategic models*
  - *Tactical models*
  - *Operational models*
  - *Analytical models*

The Model Management Subsystem

- **Strategic models**

  Models that represent problems for the strategic level (i.e., executive level) of management

- **Tactical models**

  Models that represent problems for the tactical level (i.e., midlevel) of management

Operational models

Models that represent problems for the operational level of management

Analytical models

Mathematical models into which data are loaded for analysis

The Model Management Subsystem

- Model building blocks and routines
  - ***Model building blocks***

    Preprogrammed software elements that can be used to build computerized models. For example, a random-number generator can be employed in the construction of a simulation model
- Model components for building DSS
- Modeling tools
- Model base management system: MBMS software has four main functions
  - *Model creation, using programming languages, DSS tools and/or subroutines, and other building blocks*
  - *Generation of new routines and reports*
  - *Model updating and changing*
  - *Model data manipulation*

User Interface (Dialog) Subsystem

- **User interface**

  The component of a computer system that allows bidirectional communication between the system and its user.

- **User interface management system (UIMS)**

  The DSS component that handles all interaction between users and the system

The user interface process

- ***Object***

  A person, place, or thing about which information is collected, processed, or stored

- ***Graphical user interface (GUI)***

  An interactive, user-friendly interface in which, by using icons and similar objects, the user can control communication with a computer

User Interface (Dialog) Subsystem

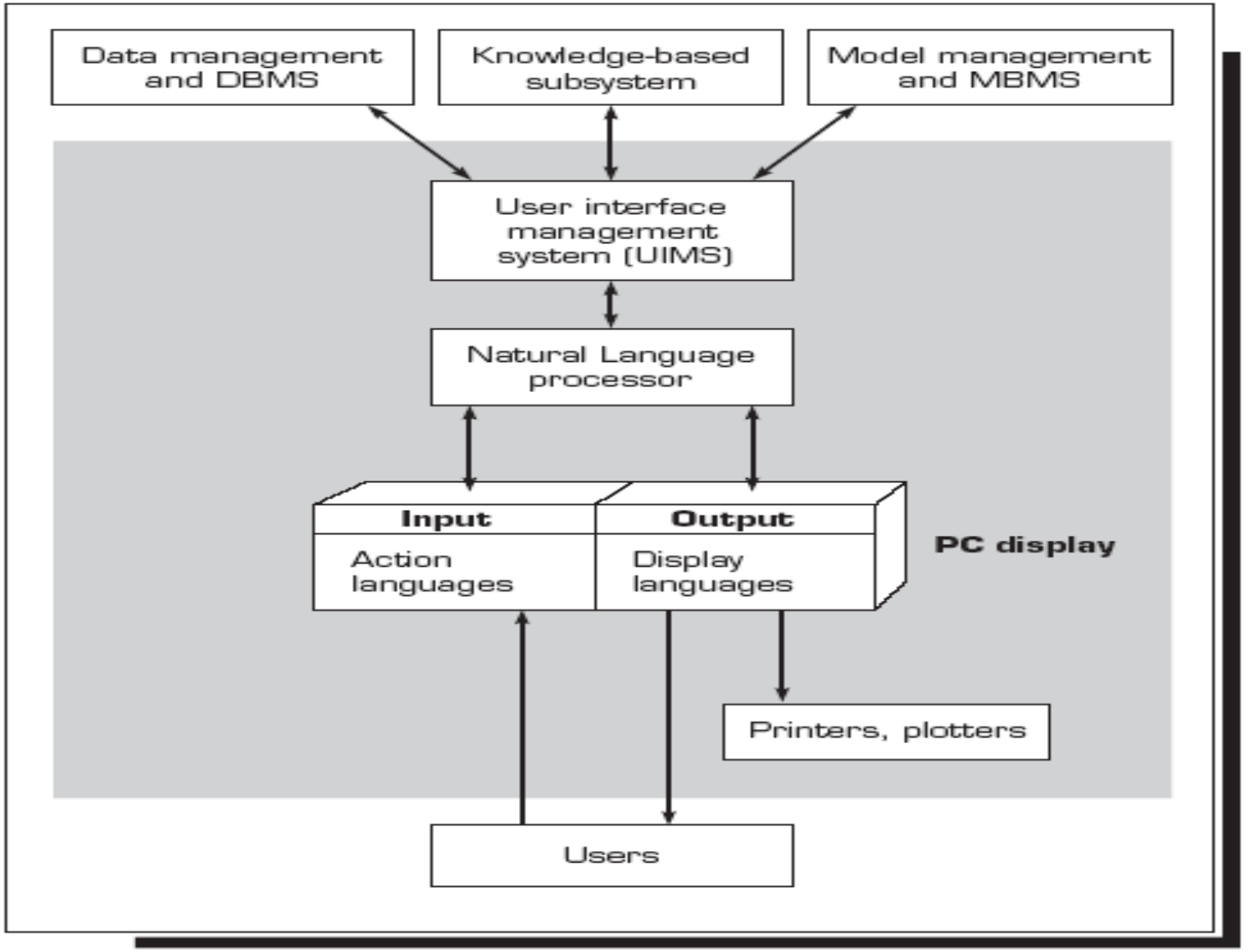


FIGURE 3.7 Schematic View of the User Interface System

User Interface (Dialog) Subsystem

- **DSS user interfaces** access is provided through Web browsers including:
  - *Voice input and output*
  - *Portable devices*
  - *Direct sensing devices*
- **DSS developments**
  - *Parallel processing hardware and software technologies have made major inroads in solving the scalability issue*
  - *Web-based DSS have made it easier and less costly to make decision-relevant information and model-driven DSS available to users in geographically distributed locations, especially through mobile devices*

User Interface (Dialog) Subsystem

- DSS developments
  - *Artificial intelligence continues to make inroads in improving DSS*
    - Faster, intelligent search engines
    - Intelligent agents promise to improve the interface in areas such as direct natural language processing and creating facial gestures
  - *The development of ready-made (or near-ready-made) DSS solutions for specific market segments has been increasing*
- DSS developments
  - *DSS is becoming more embedded in or linked to most EIS*
  - *GSS improvements support collaboration at the enterprise level*
  - *Different types of DSS components are being integrated more frequently*

Knowledge-Based Management Subsystem

- Advanced DSS are equipped with a component called a *knowledge-based management subsystem* that can supply the required expertise for solving some aspects of the problem and provide knowledge that can enhance the operation of other DSS components

The User

- The person faced with a decision that an MSS is designed to support is called the *user*, the *manager*, or the *decision maker*
- MSS has two broad classes of users: managers and staff specialists
  - *Staff specialists use the system much more frequently than manager and tend to be more detail-oriented*
  - *Staff analysts are often intermediaries between managers and the MSS*
- **Intermediary**

  A person who uses a computer to fulfill requests made by other people (e.g., a financial analyst who uses a computer to answer questions for top management)
  - ***Staff assistant***

    An individual who acts as an assistant to a manager

The User

- ***Expert tool user***

  A person who is skilled in the application of one or more types of specialized problem-solving tools

- ***Business (system) analysts***

  An individual whose job is to analyze business processes and the support they receive (or need) from information technology

Facilitators (in a GSS)

A person who plans, organizes, and electronically controls a group in a collaborative computing environment

DSS Hardware

- Hardware affects the functionality and usability of the MSS
- The choice of hardware can be made before, during, or after the design of the MSS software
- Major hardware options:
  - *Organization's servers*
  - *Mainframe computers with legacy DBMS,*
  - *Workstations*
  - *Personal computers*
  - *Client/server systems*

DSS Hardware

- Portability has become critical for deploying decision-making capability in the field, especially for salespersons and technicians
- The power and capabilities of the World Wide Web have a dramatic impact on DSS
  - *Communication and collaboration*
  - *Download DSS software*
  - *Use DSS applications provided by the company*
  - *Buy online from application service providers (ASPs)*