

# **Chapter 3**

## **Decision Support Systems: An Overview**





# Learning Objectives

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- Understand DSS configurations.
- Learn characteristics and capabilities of DSS.
- Understand DSS components.
- Describe structure of DSS components.
- Understand how DSS and the Web interact.
- Learn the role of the user in DSS.
- Understand DSS hardware and integration.
- Learn DSS configurations.



# Decision Support Systems

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- Systems designed to support managerial decision-making in unstructured problems
- More recently, emphasis has shifted to inputs from outputs
- Mechanism for interaction between user and components
- Usually built to support solution or evaluate opportunities



# Decision Support Systems

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- The early definitions of a DSS identified it as a system intended to support managerial decision-makers in semi structured decision situations.
- DSS were meant to be an adjunct to decision-makers to extend their capabilities but **not to replace their judgment.**



# DSS

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- A DSS is a methodology that supports decision-making.
- It is:
  - Flexible;
  - Adaptive;
  - Interactive;
  - GUI-based;
  - Iterative; and
  - Employs modeling.



# A DSS APPLICATION

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- A DSS is usually built to support the solution of a certain problem or to evaluate an opportunity. As such it is called a DSS application.



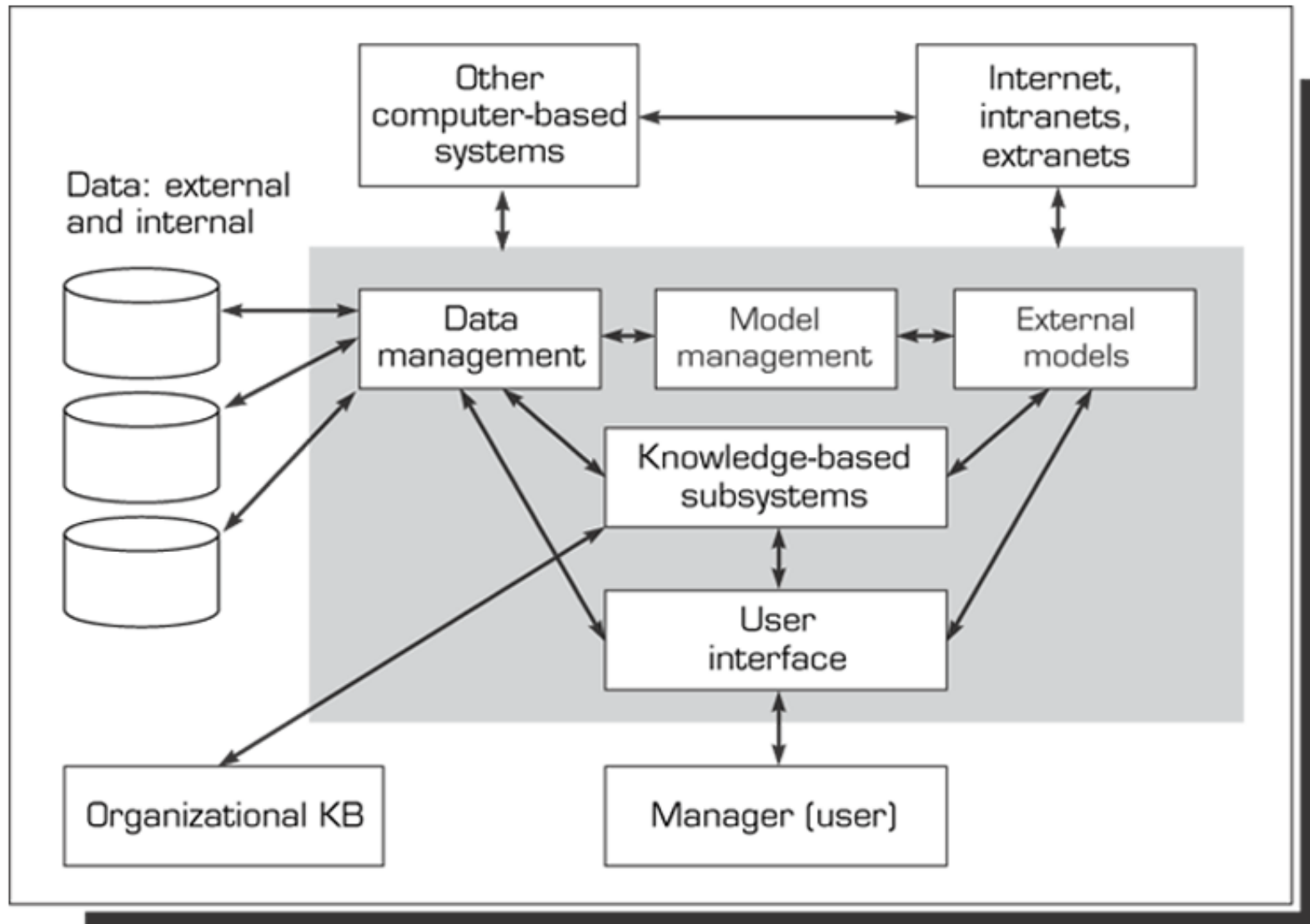
# Components of DSS

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- Subsystems:
  - Data management
    - Managed by DBMS
  - Model management
    - Managed by MBMS
  - User interface
  - Knowledge Management and organizational knowledge base



**Figure 3.3** A Schematic View of DSS





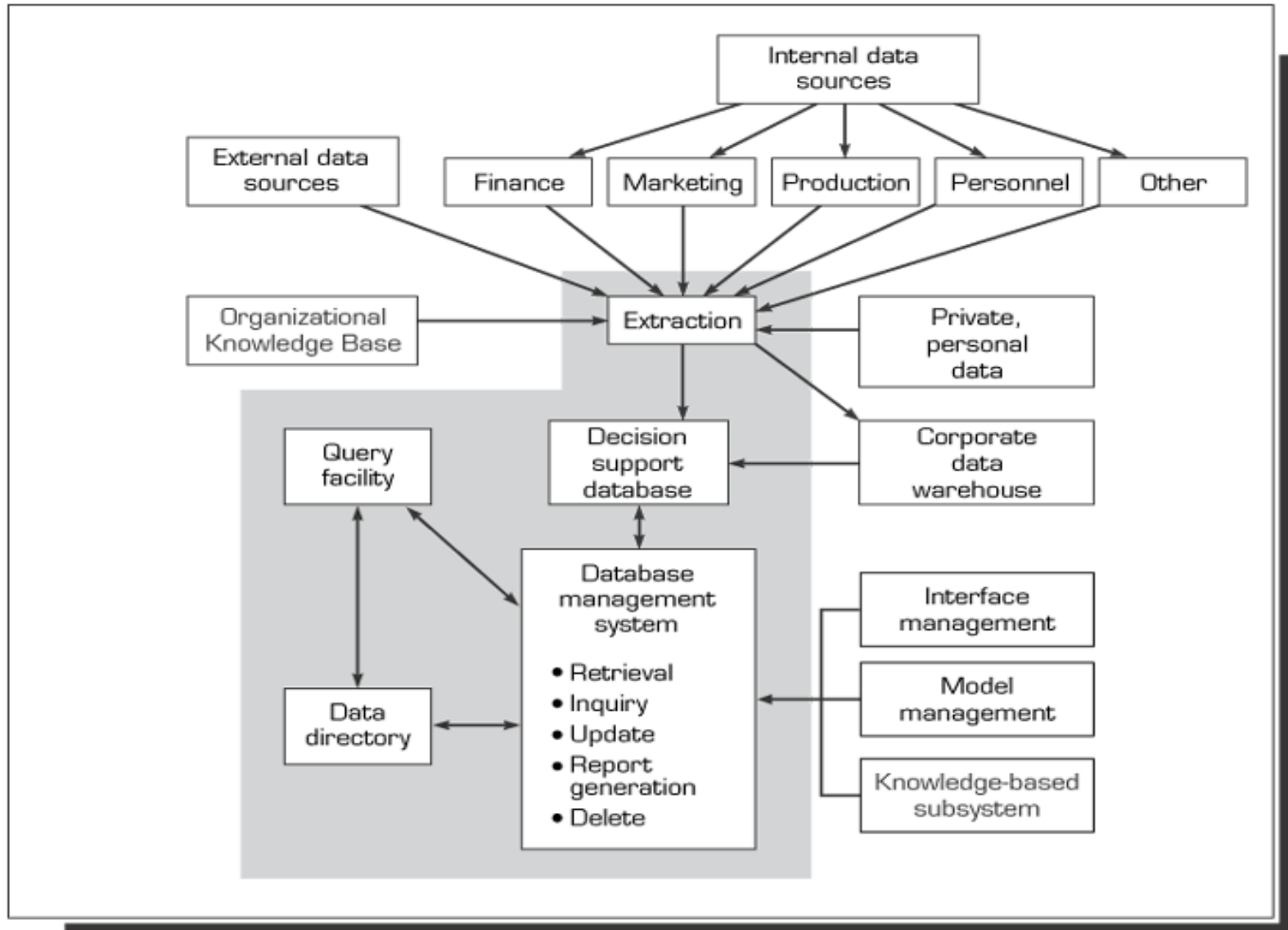


# Data Management Subsystem

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- Components:
  - Database
  - Database management system
  - Data directory
  - Query facility

**Figure 3.4** The Structure of the Data Management Subsystem





# Database

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- Interrelated data extracted from various sources, stored for use by the organization, and queried
  - Internal data, usually from TPS
  - External data from government agencies, trade associations, market research firms, forecasting firms
  - Private data or guidelines used by decision-makers



# Database Management System

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- Extracts data
- Manages data and their relationships
- Updates (add, delete, edit, change)
- Retrieves data (accesses it)
- Queries and manipulates data
- Employs data dictionary



# Data Directory

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- Catalog of all data
  - Contains data definitions
  - Answers questions about the availability of data items Source
  - Meaning
  - Allows for additions, removals, and alterations

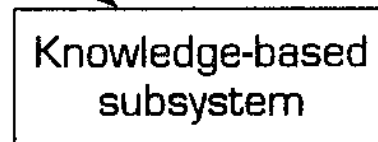
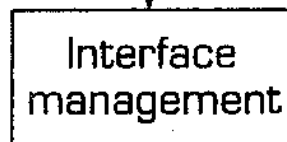
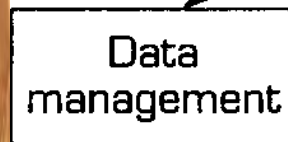
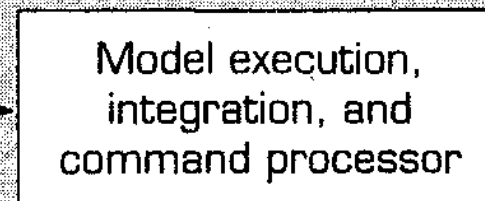
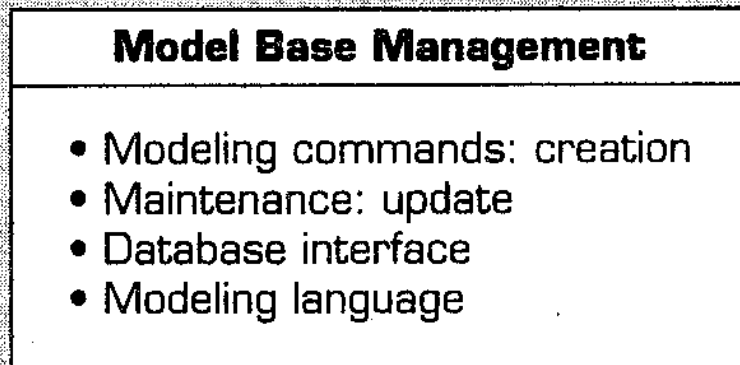
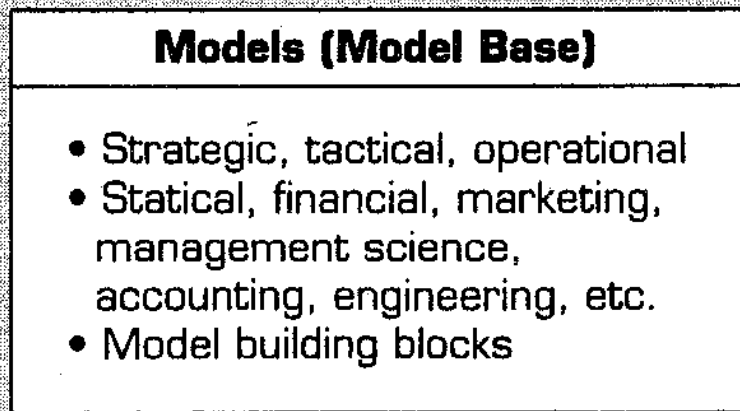


# Model Management Subsystem

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- Components:
  - Model base
  - Model base management system
  - Modeling language
  - Model directory
  - Model execution, integration, and command processor









# Model Management Subsystem

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- A **model base** contains routine and special statistical, financial, forecasting, management science, and other quantitative models that provide the analysis capabilities in a DSS.
- The models in the model base can be divided into four major categories: **strategic, tactical, operational, and analytical**. In addition, there are model building blocks and routines.



# Models---Strategic

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- Strategic
  - Supports top management decisions
  - developing corporate objectives, planning for mergers and acquisitions
  - The large-scale linear programming model is at the heart of the POP DSS that allows executives of the company to plan large, expensive equipment needs as many years ahead as needed.

# Tactical

- Tactical
  - Used primarily by middle management to assist in allocating and controlling the organization's resources.
  - Examples of tactical models include selecting a Web server, labor requirement planning, sales promotion planning, plant-layout determination, and routine capital budgeting



# Operational models

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- **Operational models** are used to support the day-to-day working activities of the organization.
- Typical decisions involve e-commerce transaction acceptance (purchases, etc.),
- approval of personal loans by a bank, production scheduling, inventory control, maintenance planning and scheduling, and quality control.



# Analytical models

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- Analytical
  - Used to perform analysis of data
- are used to perform some analysis on the data.
- They include statistical models, management science models, data mining algorithms



# Model Base Management System

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- Functions:
  - Model creation
  - Model updates
  - Model data manipulation
  - Generation of new routines
- Model directory:
  - Catalog of models
  - Definitions



# Model Management Activities

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- Model execution
  - Controls running of model
- Model command processor
  - Receives model instructions from user interface
  - Routes instructions to MBMS or module execution or integration functions
- Model integration
  - Combines several models' operations





# MAJOR FUNCTIONS OF THE MBMS

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- Creates models easily and quickly, either from scratch or from existing models or from the building blocks
- Allows users to manipulate models so that they can conduct experiments and **sensitivity analyses ranging from what-if to goal-seeking**
- Stores, retrieves, and manages a wide variety of different types of models in a logical and integrated manner

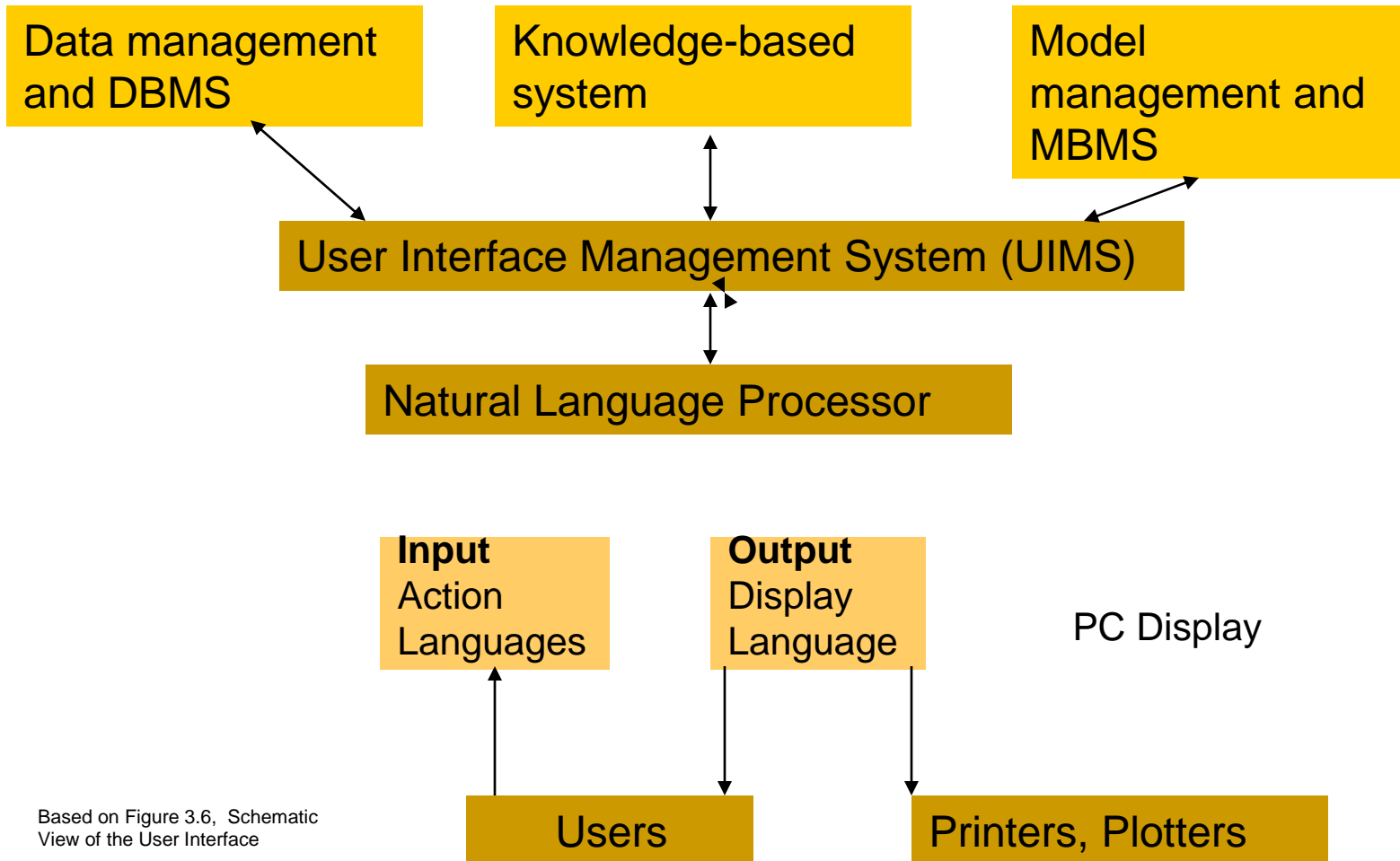


# MAJOR FUNCTIONS OF THE MBMS

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- Interrelates models with appropriate linkages with the database and integrates them within the DSS
- Manages and maintains the model base with management functions analogous to database management: store, access, run, update, link, catalog, and query
- Uses multiple models to support problem solving

# User Interface System



Based on Figure 3.6, Schematic View of the User Interface



# User Interface Management System

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- GUI
- Natural language processor
- Interacts with model management and data management subsystems
- Examples
  - Speech recognition
  - Display panel
  - Tactile interfaces
  - Gesture interface



# Knowledge-Based Management System

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- Expert or intelligent agent system component
- Complex problem solving
- Enhances operations of other components
- May consist of several systems
- Often **text-oriented DSS**



# DSS Hardware

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- De facto standard
- Web server with DBMS:
  - Operates using browser
  - Data stored in variety of databases
  - Can be mainframe, server, workstation, or PC
  - Any network type
  - Access for mobile devices

## Lecture 003

# **DSS Classifications**



- The first two types are *data-oriented*, performing data retrieval or analysis; the third deals both with data and models.
- The remaining four are *model-oriented*, providing simulation capabilities, optimization, or computations that suggest an answer.

- classify DSS into the following six frameworks:

1. text-oriented DSS,
2. database-oriented DSS,
3. spreadsheet-oriented DSS,
4. solver-oriented DSS,
5. rule-oriented DSS,
6. and compound DSS.

## TEXT-ORIENTED DSS

- Information (including data and knowledge) is often stored in a **textual format** and must be accessed by decision-makers.
- it is necessary to represent and process text documents and fragments effectively and efficiently.
- **A text-oriented DSS** supports a decision-maker by electronically keeping track of textually represented information that could have a bearing on decisions.
- There are many text-oriented DSS applications. **electronic document management systems, knowledge- management, content management, and business rules systems.** Content management systems (CMS) are used to manage the material posted on Web sites.

## DATABASE-ORIENTED DSS

- **In** this type of DSS, the database organization plays a major role in the DSS structure.
- Early generations of database-oriented DSS mainly used **the relational database configuration**.
- The information handled by relational databases tends to be voluminous, descriptive, and rigidly structured.
- A database-oriented DSS features strong report generation and query capabilities.

## SPREADSHEET-ORIENTED DSS

- spreadsheet is a modeling system that allows the user to develop models to execute DSS analysis.
- These models not only create, view, and modify procedural knowledge.'
- but also instruct the system to execute their self-contained instructions (macros), **Spreadsheets are widely used in end-user** developed DSS.
- some spreadsheet development tools include what-if analysis and goal-seeking capabilities

# SOLVER-ORIENTED DSS

- A solver is an algorithm or procedure written as a computer program for performing certain computations for solving a particular problem type.
- Examples of a solver can be an economic order quantity procedure for **calculating an optimal ordering quantity or a linear regression routine for calculating a trend.**
- A solver can be commercially programmed in development software. For example, Excel, includes several powerful *solvers-functions* and *procedures-that* solve a number of standard business problems. The DSS builder can incorporate the solvers in creating

# RULE-ORIENTED DSS

- The knowledge component of DSS includes both **procedural and inferential (reasoning) rules**, often in an expert system format. These rules can be qualitative or quantitative, and such a component can replace quantitative models or can be integrated with them.
- **COMPOUND DSS** A compound DSS is a hybrid system that includes two or more of the five basic structures described earlier



# INTELLIGENT DSS

- The so-called intelligent or knowledge-based DSS has attracted a lot of attention.
- The rule-oriented DSS that we described above can be divided into six types: descriptive, procedural, reasoning, linguistic, presentation