MODULE TWO IMPORTANT TOPICS

PHASES OF THE DECISION-MAKING PROCESS

- Simon's decision-making model (1977) describes a systematic process with four key phases: intelligence, design, choice, and implementation, with monitoring as a feedback mechanism

Intelligence Phase:

- Examines reality to identify and define the problem.
- Establishes problem ownership.
- Begins with problem discovery and understanding.
- Involves feedback loops, which may lead back to this phase from later phases.
- Forms the foundation for the design and choice phases.

Design Phase:

- Constructs a model to represent the system by simplifying reality.
- Defines relationships among all variables.
- Validates the constructed model.
- Determines criteria for evaluating alternative solutions.
- Often, the model development process helps identify alternative solutions.

Choice Phase:

- Selects a proposed solution to the model (not necessarily solving the problem itself at this stage).
- Tests the proposed solution for viability.
- If the solution appears reasonable, it moves to the implementation phase.
- Failure in testing or application may lead back to earlier phases for revision.

Implementation Phase:

- Involves executing the chosen solution.
- Successful implementation resolves the real problem.
- Unsuccessful implementation necessitates a return to earlier phases (intelligence, design, or choice).
- Represents the culmination of the decision-making process, dependent on successful execution.

Monitoring (Feedback):

- Viewed as the intelligence phase applied to the implementation phase.

- Continuous monitoring ensures the implementation aligns with objectives and adapts to any new issues.
- Feedback loops can return to any earlier phase, making the process iterative.

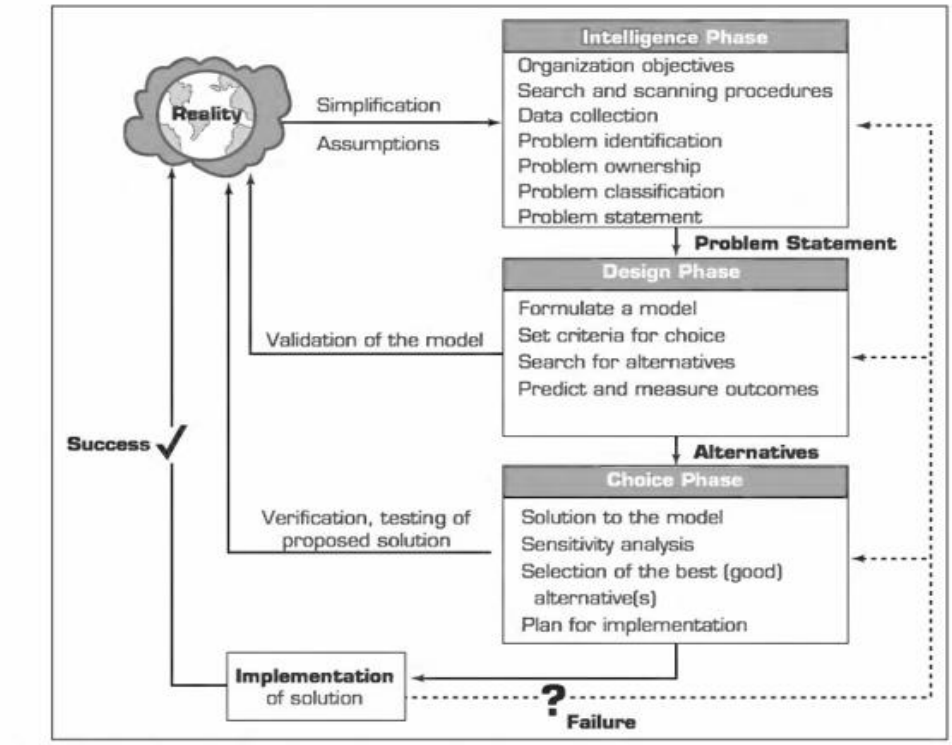

FIGURE 2.1 The Decision-Making/Modeling Process.

Key Features:

- There is a continuous flow of activity from intelligence to design to choice.
- Feedback loops explain the iterative and sometimes chaotic nature of the decision-making process.
- Modeling is essential for understanding and evaluating options, forming the core of the design phase.
- The process is not always linear, and returning to earlier phases is common and necessary.
- Web technologies and computerized support systems influence all phases, enhancing collaboration and efficiency.

HOW DECISIONS ARE SUPPORTED

Support for the Intelligence Phase:

1. **Purpose**: Scans internal and external environments to identify opportunities and problems.
2. **Key Tools**:
    - **Web Tools**: Web browsers, OLAP, data mining, and data warehouses.

- **Dashboards/Portals**: Web-based enterprise information portals for monitoring internal and external data.
- **Geographic Information Systems (GIS)**: Identify spatial opportunities and problems.
- **Knowledge Management Systems (KMS)**: Use past situations for insights.
- **Group Support Systems (GSS)**: Facilitate brainstorming and information sharing.
- **Expert Systems (ES)**: Diagnose problems, classify their nature, and suggest solutions.
- **Business Activity Monitoring (BAM) and Business Process Management (BPM)**: Quickly identify and address operational issues.

3. **Data Challenges**:
   - Availability, accuracy, cost, security, and qualitative (soft) nature of data.
   - Information overload due to excessive data.
4. **Qualitative Analysis**: High unstructuredness in problems makes DSS helpful for understanding and framing issues.

Support for the Design Phase:

1. **Purpose**: Generates alternative solutions, evaluates criteria, and forecasts consequences.
2. **Key Tools**:
   - **Decision Support Systems (DSS)**: Provide financial and forecasting models for structured problems.
   - **OLAP and Data Mining**: Identify relationships for model generation.
   - **Expert Systems (ES)**: Provide expertise for complex problem-solving.
   - **KMS**: Help identify past similar problems and experts.
   - **CRM, ERP, and SCM Systems**: Model business processes to test assumptions and scenarios.
   - **Brainstorming Tools**: GSS and cognitive mapping tools for creative solutions.
3. **Application**: Saves costs and time in engineering design and business problem-solving.

Support for the Choice Phase:

1. **Purpose**: Selects and evaluates a solution.
2. **Key Tools**:
    - **DSS**: Conduct "what-if" and goal-seeking analyses for evaluating scenarios.
    - **KMS**: Provides past experiences to reinforce decisions.
    - **CRM, ERP, and SCM Systems**: Test decision impacts for value generation.
    - **Expert Systems (ES)**: Recommend suitable solutions and assess their desirability.
    - **GSS**: Help achieve group consensus in decision-making.
3. **Result**: Identifies the best or most feasible alternative for implementation.

Support for the Implementation Phase:

1. **Purpose**: Ensures effective execution of decisions.
2. **Key Tools**:
    - **DSS**: Aid in decision communication, explanation, and justification.
    - **Reporting Tools**: BAM, BPM, KMS, EIS, ERP, CRM, and SCM systems track implementation progress.
    - **CRM**: Identifies and assesses the impact of changes, e.g., eliminating unprofitable customers.
    - **Expert Systems (ES)**: Advise on handling resistance to change, provide training, and address implementation issues.
3. **Collaboration**: GSS enhances team collaboration and communication.
4. **Value Chain Impact**: BAM, BPM, SCM, and CRM report impacts, feeding back into the intelligence phase for continuous improvement.

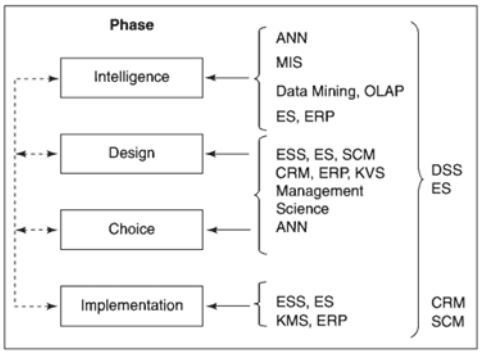

FIGURE 2.2 DSS Support.

CHARACTERISTICS AND CAPABILITIES OF DSS

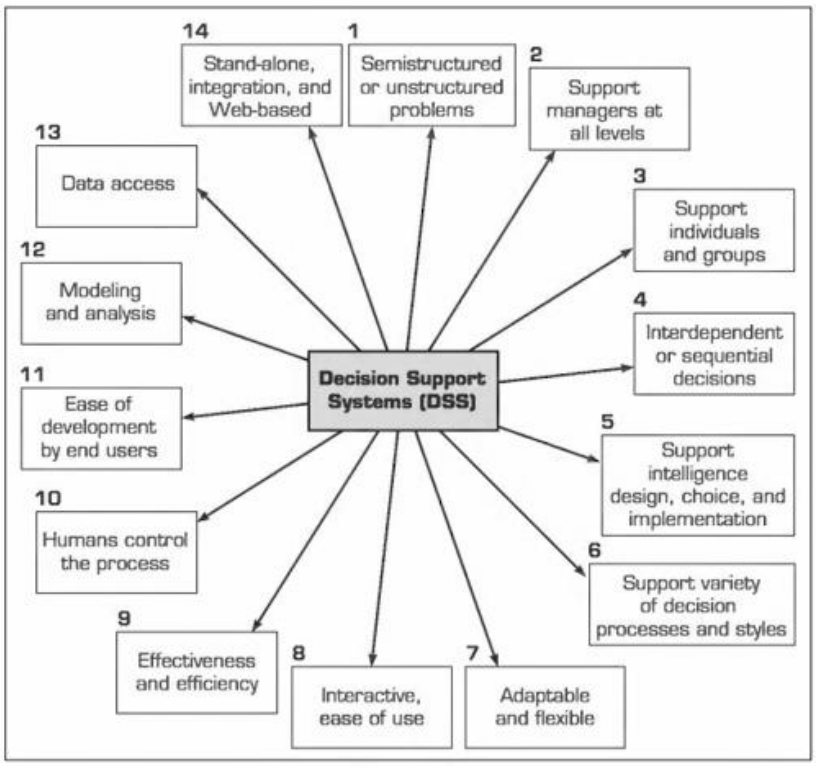

FIGURE 2.3 Key Characteristics and Capabilities of DSS.

1. Supports semistructured and unstructured problems by integrating human judgment and computerized information. These problems gain structure as the DSS develops and can also solve structured problems.
2. Provides support for all managerial levels, from executives to line managers.
3. Supports both individuals and groups, including virtual teams, using collaborative Web tools. It assists individual decision-making and independent group work.
4. Facilitates interdependent and/or sequential decisions, made once, multiple times, or repeatedly.
5. Supports all phases of the decision-making process: intelligence, design, choice, and implementation.
6. Accommodates various decision-making processes and styles.
7. DSS is flexible, allowing users to adapt to changing conditions by modifying elements or solving similar problems.

8. Offers user-friendly interfaces, strong graphics, and natural language interaction, often through Web or mobile platforms.
9. Focuses on improving decision-making effectiveness (e.g., accuracy, quality) rather than efficiency, even if it takes longer.
10. Ensures the decision maker retains control over all decision-making steps, supporting but not replacing them.
11. Allows end users to develop and modify simple systems, while larger systems are built with IS specialists' help. Tools like spreadsheets, OLAP, and data mining enable building complex systems.
12. Uses models for analysis and experimentation, testing strategies under different conditions.
13. Provides access to diverse data sources, including GIS, multimedia, and object-oriented data.
14. Can function as a stand-alone tool for individuals or be distributed across organizations, integrated with other DSS, and accessed via Web and networking technologies.

DSS CLASSIFICATIONS (10 Types)

It includes the following categories:

• Communications-driven and group DSS (GSS)
• Data-driven DSS
• Document-driven DSS
• Knowledge-driven DSS, data mining, and management ES applications
• Model-driven DSS

➢ **Communications-Driven and Group DSS (GSS)**:

- Supports **group tasks** that may or may not include decision-making by using computer, collaboration, and communication technologies.
- Includes systems supporting meetings, design collaboration, and supply chain management.
- Knowledge Management Systems (KMS) designed for collaborative work also fall into this category.

- **Data-Driven DSS**:

- Primarily focuses on processing **data into information** and presenting it to decision-makers.
- Minimal emphasis on mathematical models; relies heavily on database organization, often using data warehouses.
- Early database-oriented DSS used relational database configurations with structured, descriptive, and voluminous data.
- Features strong report generation and query capabilities, often applied in OLAP, reporting, and business analytics systems.
- Examples and further details are covered in data warehousing and Business Performance Management (BPM) chapters.

- **Document-Driven DSS**:

- Relies on **knowledge coding,** analysis, search, and retrieval to support decision-making.
- Includes all DSS that are text-based, such as most KMS.
- Minimal focus on mathematical models; aims to support decisions using documents in oral, written, or multimedia forms.
- Example: A system developed for the U.S. Army's Defense Ammunitions Center.

- **Knowledge-Driven DSS**:

- Involves the application of knowledge technologies to address specific decision-support needs.
- Includes Artificial Neural Networks (ANN) and Expert Systems (ES) that automate the decision-making process using rules or symbolic storage.
- Particularly useful for quick decisions, such as those required in e-commerce settings.
- Examples include intelligent DSS used for automated systems.

- **Model-Driven DSS:**

- Focuses on **optimization and simulation models** with significant activities in model formulation, maintenance, and management.
- Supports what-if analyses and optimization of objectives (e.g., profit).
- Commonly used tools include Microsoft Excel, which provides statistical packages, Solver (linear programming), and financial and management science models.
- These systems are also categorized under prescriptive analytics.
- Examples include large-scale applications at Procter & Gamble and HP.

➢ **Compound DSS**:

- **Combines** two or more DSS types for enhanced functionality.
- Examples:
    - Expert Systems combined with optimization models.
    - Data-driven DSS feeding large-scale optimization models.
    - Documents used to interpret data-driven results.
- Emerging tools like WolframAlpha compile knowledge from databases, models, algorithms, and documents to synthesize answers to specific questions. Examples include stock comparisons, exercise calorie burn analysis, or identifying medication side effects.

Other DSS Categories

➢ **Institutional DSS:**

- Supports recurring decisions, such as portfolio management systems (PMS) used by large banks for investment decisions.
- Developed and refined over time as it evolves to address identical or similar problems repeatedly.
- Not necessarily used by everyone in an organization; the recurring nature of the problem determines its classification as institutional.

➢ **Ad Hoc DSS:**

- Designed to handle specific, nonrecurring problems, often related to strategic planning or management control.
- Justifying a DSS for one-time or infrequent use is a challenge.
- Ad hoc DSS often evolve into institutional DSS when:
- The problem recurs, leading to repeated use.
- Other users in the organization have similar needs that the system can address.

➢ **Custom-Made DSS:**

- Built specifically for individual users or organizations to address unique problems.
- Ideal for non-routine issues that may not have a widely applicable solution.

➢ **Ready-Made DSS:**

- Generic systems built to solve similar problems across organizations or functional areas (e.g., finance, marketing, accounting).
- Provided by vendors such as Cognos, MicroStrategy, and Teradata.

- Flexible and cost-effective, with built-in databases, models, interfaces, and support features.
- Users need only to add their organization's data and logo.
- Incorporates OLAP, DSS generators, and Internet technologies for database access, communications, and Web-based interfaces.
- Examples include DSS templates for finance, real estate, and marketing.

COMPONENTS OF DECISION SUPPORT SYSTEMS

A DSS includes four major components: **Data Management Subsystem**, **Model Management Subsystem**, **User Interface Subsystem**, and an optional **Knowledge-Based Management Subsystem**.

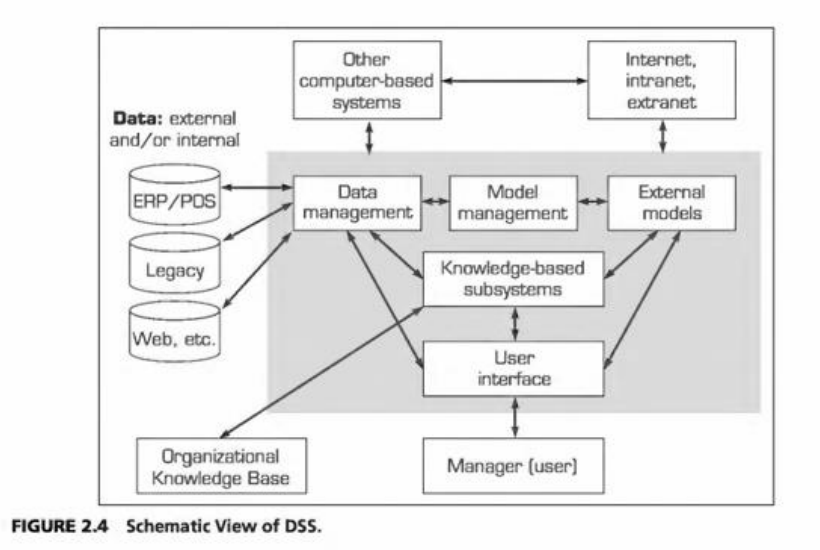

FIGURE 2.4 Schematic View of DSS.

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1. Data Management Subsystem

- **Purpose**: Manages relevant data for decision-making, often linked to corporate data warehouses or Web servers.
- **Components**:
  - **DSS database**: Stores decision-relevant data.
  - **Database Management System (DBMS)**: Manages and queries the database.
  - **Data directory**: Metadata directory for accessing and organizing data.
  - **Query facility**: Enables users to retrieve and manipulate data.

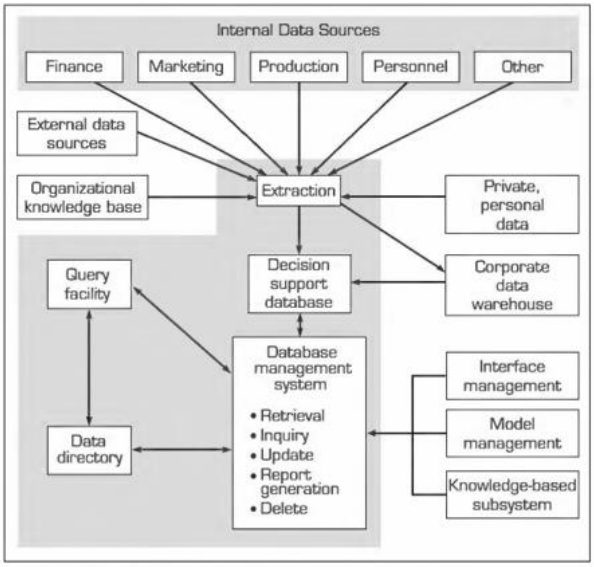

FIGURE 2.5 Structure of the Data Management Subsystem.

- **Key Features**:
  - Integrates with corporate data sources, providing structured, voluminous data for analysis.
  - Supports BI and descriptive analytics applications like reporting and OLAP.
  - Enables interaction with other DSS components and external data sources.

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2. Model Management Subsystem

- **Purpose**: Provides analytical capabilities using financial, statistical, and optimization models.
- **Components**:
  - **Model base**: Contains various models for analysis.
  - **Model Base Management System (MBMS)**: Manages the models and ensures integration.
  - **Modeling language**: Used to develop and customize models.
  - **Model directory**: Organizes and stores metadata about models.
  - **Model execution, integration, and command processor**: Executes and integrates models with DSS processes.

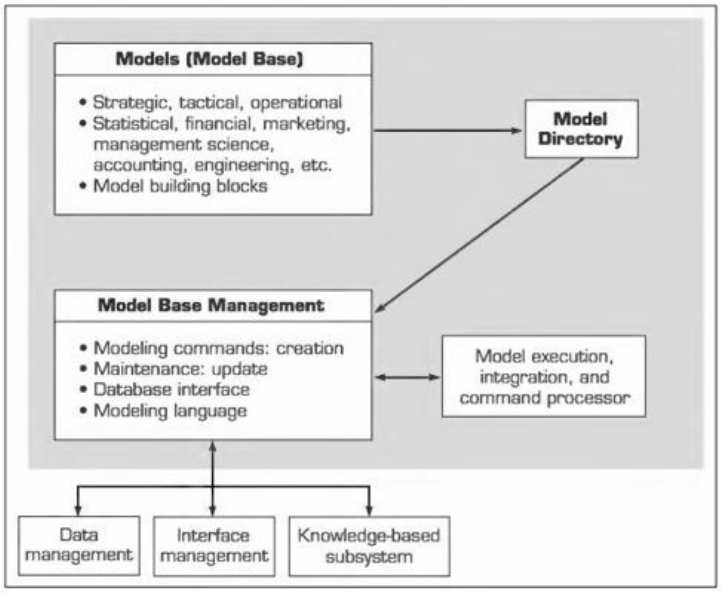

FIGURE 2.6 Structure of the Model Management Subsystem.

- **Key Features**:
  - Facilitates what-if analysis, goal-seeking, and optimization.
  - Integrates multiple models (e.g., forecasting feeding production scheduling models).
  - Can use tools like **Excel**, although it may pose challenges in documentation and error handling for large models.
  - Advanced modeling software (e.g., SPSS, Arena, Planners Lab) provides user-friendly visualization and assumption testing.
  - Supports iterative exploration of assumptions using data from historical performance, market research, and decision-makers' experiences.

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3. User Interface Subsystem

- **Purpose**: Provides a means for users to interact with the DSS effectively.
- **Key Features**:
  - Common interfaces include **Web browsers**, **dashboards**, and **spreadsheets**.
  - Mobile devices (e.g., smartphones, tablets) allow decision-making on the go.
  - Natural-language input (e.g., Siri, Google Now) and **voice commands** improve accessibility.
  - Supports innovative input methods like SMS-based requests (e.g., Google SMS for search, translation, or calculations).
  - Integrates inputs from physical devices (e.g., RFID chips) for real-time decision support in areas like supply chain management.

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4. Knowledge-Based Management Subsystem (Optional)

- **Purpose**: Augments decision-making by integrating organizational knowledge.
- **Key Features**:
    - Provides intelligence to support the **data, model, and user interface subsystems**.
    - Connects with Knowledge Management Systems (KMS) and organizational knowledge bases.
    - Incorporates AI-based tools (e.g., IBM Watson) for enhanced decision-making and insight generation.

Emerging Developments in DSS

1. **Web-Based DSS**:
    - Easier access to decision support across geographically distributed teams through Web browsers and mobile platforms.
    - XML and other Web technologies enable seamless integration with other enterprise systems.
2. **Integration of DSS Components**:
    - Tools like GIS are integrated with traditional DSS to enhance decision-making.
    - DSS components are embedded in **CRM, SCM, ERP**, and other systems, increasing their capabilities.
3. **Advances in Hardware and Software**:
    - Hardware improvements (smaller size, faster processing) enhance DSS functionality.
    - Data warehouses now manage petabytes of data for retail and news industries.
4. **Collaboration Support**:
    - Group Support Systems (GSS) facilitate enterprise-wide collaboration.
    - DSS integrates with educational and enterprise systems, embedding decision-making in areas like CRM, SCM, and KM.
