

IS 301 DECISION SUPPORT SYSTEMS

DECISION SUPPORT SYSTEMS AND INTELLIGENT SYSTEMS,  
Seventh Edition

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## Chapter 2

# **Management Support Systems**

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# Chapter 2    Management Support Systems

## Learning Objectives

- Understand how computer technologies can **assist** managers in their work
- Learn the basic **concepts** of decision-making
- Learn the **basic concepts** of decision support systems
- Recognize the **different types** of decision support systems used in practice
- Understand how the **World Wide Web/Internet** has affected decision support systems

## 1.3 Managerial Decision-making And Information Systems

- Two important topics: **managerial decision-making** and **information systems**
- **Management** is a **process** by which organizational goals are achieved using resources.
- The **resources** are considered **inputs**, and
- The **goals** is viewed as the **output**
- The degree of success **measured** by the **ratio** of outputs to inputs is called the **organization's productivity**.
- Productivity is also a very important issue at the **national** level
- National productivity is the **aggregate** of the productivity of all the people and organizations in the country.

## 1.3 Managerial Decision-making And Information Systems

- The **manager** is primarily a decision-maker .
- Organizations are **filled** with decision-makers **at various levels**.
- Management was considered an **art** because a variety of individual styles could be used in solving the managerial problems.

Make decisions is more **difficult** for several reasons.

**1. First**, the number of available alternatives is much **larger** than ever before, because of improved technology and communication systems, especially the Web/Internet.

- As **more** data and information become available, more alternatives.
- Despite the speed at which data and information can be **accessed**, the decision-making alternatives **must be taken**

## 1.3 Managerial Decision-making And Information Systems

2. **Second**, the **cost** of making **errors** can be **large** because of the complexity and magnitude of operations, automation, and the chain reaction that an error can cause in many parts of the organization.
  3. **Third**, there are **continuous changes** in the fluctuating environment and more uncertainty in several impacting elements.
  3. **Finally**, decisions must be made **quickly** to respond to the market.
- Advances** in technology, notably the Web, have dramatically **increased** the speed at which we obtain information and the expected speed at which we make our decisions.

## 1.3 Managerial Decision-making And Information Systems

- it is nearly impossible to rely on a **trial-and-error** approach to management, especially for decisions involving the factors shown in Figure 1.1.
- Managers must be more **sophisticated**: They must use the new **tools and techniques** of their fields.
- Web-based technology creating effective decision-making.

## 1.3 Managerial Decision-making And Information Systems

Factor	Trend	Results
Technology Information/computers	Increasing Increasing	More alternatives to choose from
Structural complexity Competition International markets	Increasing Increasing Increasing	Larger cost of making errors
Political stability Consumerism	Decreasing Increasing	More uncertainty regarding the future
Government intervention Changes, fluctuations	Increasing Increasing	Need for quick decision

## 1.4 Managers And Computer Support

- The **impact** of computer technology on organizations and society is **increasing as new technologies** evolve and current technologies expand.
- Nearly all **executives** know that information technology is **vital** to their business and extensively **use** technologies, especially Web-based technologies.
- Topics such as **data warehousing**, **data mining**, online analytical processing (OLAP), and the use of the Web via the **Internet**, **intranets** and **extranets** for decision support.
- Managers must have **high speed**, **networked** information systems to **assist** them directly with their most important task: **making decisions**



## 1.5 Computerized Decision Support And The Supporting Technologies

A computerized decision support system may be **needed for various reasons**:

1. **Speedy computations**. A computer lets the decision-maker perform many computations **quickly and at a low cost**. Timely decisions are **critical** for many situations,
2. **Improved communication**. Groups can **collaborate and communicate** readily with Web-based tools. Collaboration is especially important along the supply chain..
3. **Increased productivity**. Computerized support can **reduce the size** of the group and **saving travel costs**. The productivity of staff **increased**, by using **optimization tools** that determine the **best way** to run a business.

## 1.5 Computerized Decision Support And The Supporting Technologies

4. **Technical support.** Many decisions involve **complex** computations. The data **stored** in different databases as text, sound, graphics, and video. It may be necessary to transmit them quickly from distant locations.
5. **Data warehouse access.** Large data warehouses contain petabytes of data. Special methods are needed to **organize** and **search** the data.
6. **Quality support.** Computers can **improve** the quality of the decisions made. Perform complex simulations, check many possible scenarios, and assess diverse impacts quickly and economically. All these capabilities lead to **better** decisions.

## 1.5 Computerized Decision Support And The Supporting Technologies

7. **Competitive edge:** Competitive pressures make the job of decision-making difficult. Competition is **based not** just on **price** but **on quality**, timeliness, customization of products, and customer support. Organizations **must be able** to frequently and rapidly **change their mode** of operation **reengineer** processes and structures, empower employees, and innovate.
8. **Overcoming cognitive limits in processing and storage.** The human mind has only a **limited** ability to **process** and **store** information, so, the supporting technology help.

# Computerized Decision Support And The Supporting Technologies (Additional Model)

- Most decision-support methods **provide for quick data queries** and **use models to convert the data into usable information** for consideration by a decision-maker. Additional information for decision-making:

## 1. COGNITIVE LIMITS

- The term cognitive limits **indicate** that an **individual's** problem-solving capability is **limited** when a wide range of **diverse** information and knowledge is **required**.
- Computerized systems enable people to **quickly access** and **process vast** amounts of stored information.
- Computers can also **improve coordination** and **communication** for group work, as is done in Group Support Systems (**GSS**), Knowledge Management Systems (**KMS**), and several types of Enterprise Information Systems (**EIS**).

# Computerized Decision Support and The Supporting Technologies (additional model)

## 2. DECISION SUPPORT TECHNOLOGIES

- Decision support can be provided by **one or more** decision support-technologies.
- The term management support system (MSS) **refers** to the **application** of any technology, either as an **independent tool** or in **combination** with other information technologies, **to support** management **tasks** in general and decision-making in particular.
- **MSS** term may be used **interchangeably** with decision support system (**DSS**) and business

## 1.6 A Framework For Decision Support

Before describing specific management support technologies, we present a classic framework for decision support.

The classic framework for helps to cover several additional issues, such as the relationship between the technologies and the evolution of computerized systems.

- Structured processes (called programmed) are routine and standard solution methods exist.

An example of a structured decision in a company is whether or not to withdraw funds from an international account depending on the current exchange rate

- Unstructured (non-programmed) decisions are fuzzy, complex problems for which there are no cut-and-dried solution methods.

## 1.6 A Framework For Decision Support

Simon also describes the decision-making process with a **three-phase** process of **intelligence**, **design**, and **choice**

- **Intelligence**: searching for **condition that call for** decisions
- **Design**: inventing, developing, and analyzing possible **course of action**.
- **Choice**: **selecting** a course of action from those available

An **unstructured** problem is one in which **none** of these three phases is structured.

Decisions in which **some but not all** of the phases are structured are called **semi-structured**.

In a **structured** problem, the procedures for obtaining the **best** (or at least a **good** enough) solution, e.g., known **inventory** level or choosing an optimal investment strategy the objectives are **clearly defined**. The **objectives** are **cost** minimization and **profit** maximization.

## 1.6 A Framework For Decision Support

- In an **unstructured** problem, **human intuition** is often the basis for decision-making, include planning **new services**, **hiring** an executive, and **choosing** a set of **research** and **development** projects for the next year.
- **Semi-structured** problems **fall between** structured and unstructured problems, having **some structured** elements and **some unstructured** elements. Solving them involves a **combination** of both **standard** solution procedures and **human** judgment.



**Figure 1.2** Decision Support Frameworks

Type of Decision	Type of Control			Technology Support Needed
	Operational Control	Managerial Control	Strategic Planning	
<b>Structured</b>	Accounts receivable, account payable, order entry <b>1</b>	Budget analysis, short-term forecasting, personnel reports, make-or-buy <b>2</b>	Financial management (investment), warehouse location, distribution systems <b>3</b>	Management information system, management science models, transaction processing
<b>Semistructured</b>	Production scheduling, inventory control <b>4</b>	Credit evaluation, budget preparation, plant layout, project scheduling, reward system design, inventory categorization <b>5</b>	Building new plant, mergers and acquisitions, new product planning, compensation planning, quality assurance planning, HR policies, inventory planning <b>6</b>	DSS, KMS, GSS, CRM, SCM
<b>Unstructured</b>	Selecting a cover for a magazine, buying software, approving loans help desk <b>7</b>	Negotiating, recruiting an executive, buying hardware, lobbying <b>8</b>	R & D planning, new technology development, social responsibility planning <b>9</b>	GSS, KMS ES, neural networks
<b>Technology Support Needed</b>	Management information system, management science	Management science, DSS, ES, EIS, SCM CRM, GSS, SCM	GSS, CRM EIS, ES, neural networks, KMS	

Research dev.

# Technology Support Based on Anthony's Taxonomy

	Type of Control		
Type of Decision:	Operational Control	Managerial Control	Strategic Planning
Structured (Programmed)	Accounts receivable, accounts payable, order entry	Budget analysis, short-term forecasting, personnel reports	Investments, warehouse locations, distribution centers
Semistructured	Production scheduling, inventory control	Credit evaluation, budget preparation, project scheduling, rewards systems	Mergers and acquisitions, new product planning, compensation, QA, HR policy planning الدمج والاستحواذ، تخطيط منتج جديد ، التعويض ، ضمان الجودة ، تخطيط سياسة الموارد البشرية
Unstructured (Unprogrammed)	Buying software, approving loans, help desk	Negotiations, recruitment, hardware purchasing	R&D planning, technology development, social responsibility plans 18

# Technologies for Decision-Making Processes

Type of Decision	Technology Support Needed
Structured (Programmed)	MIS, Management Science Models, Transaction Processing
Semistructured	DSS, KMS, GSS, CRM, SCM
Unstructured (Unprogrammed)	GSS, KMS, ES, Neural networks

# Technology Support Based on Anthony's Taxonomy

	Type of Control		
	Operational Control	Managerial Control	Strategic Planning
Technology Support Needed	MIS, Management Science	Management Science, DSS, ES, EIS, SCM, CRM, GSS, SCM	GSS, CRM, EIS, ES, neural networks, KMS

# Computer Support For Structured Decisions

## MANAGEMENT SCIENCE

- The management science approach **adopts** the view that managers follow a **systematic** process in **solving problems** and to **automate** portions of managerial decision-making.

The systematic process **involves** the following **steps**:

1. **Defining the problem** (a decision situation that may deal with some **difficulty** or with an **opportunity**).
2. **Classifying** the problem into a **standard category**.
3. Constructing a **mathematical model** that describes the real-world problem.
4. Finding possible **solutions** to the modeled problem and evaluating them.
5. **Choosing** and **recommending** a solution to the problem.

# Computer Support For Structured Decisions

The management science process is **based** on mathematical modeling (algebraic expressions that describe the problem).

**Modeling** involves **transforming** the **real-world** problem into an appropriate **prototype** structure (model).

- Less structured problems can be handled only by a DSS that includes **customized** modeling capabilities.
- Internet and World Wide Web servers and tools have been dramatic **changes** in how decision-makers are supported.

1. **access** to a vast body of data available around the world, and
2. a common, **user-friendly graphical** user interface (GUI), which is **easy** to learn and use and readily available.

## 1.7 E-concept Of Decision Support Systems

- Scott Morton defined DSS as "interactive computer-based systems, which help decision-makers utilize data and models to solve unstructured problems
- Decision support systems couple the intellectual resources of individuals with the capabilities of the computer to improve the quality of decisions. It is a computer-based support system for management decision makers who deal with semi-structured problems.

## 1.7 E-Concept Of Decision Support Systems

### DSS AS AN UMBRELLA TERM

- DSS is used by **some** as a **specific tool**.
- Term DSS used as an umbrella term to **describe** any **computerized system** that **supports** decision-making in an organization.
- An organization may have a **knowledge** management system to **guide** all its personnel in their problem-solving, it may have **separate** DSS for marketing, finance, and accounting, a supply chain management (SCM) system for production, and several expert systems for product repair diagnostics and help desks.
- DSS **encompasses** them all.



## 1.7 E-Concept Of Decision Support Systems

### WHY USE A DSS?

Surveys have identified the **many reasons** these include:

1. **Competition** has increased..
2. **Existing systems do not support decision-making.** The Information systems department is too busy and cannot address all **management** inquiries.
3. **Special analysis** of profitability and efficiency is **needed**.
4. **Accurate** information is **needed**.
5. DSS is viewed as an organizational **winner**.

## 1.7 E-Concept Of Decision Support Systems

### WHY USE A DSS?

6. Management **mandates (authorized) / order** a DSS.
7. Higher decision **quality**.
8. **Improved communication**.
9. **Improved** customer and employee **satisfaction**.
10. **Timely** information is provided.
11. **Cost reduction** is achieved (cost and timesaving, increased productivity).

## 1.8 Group Support Systems

- Groups make **many major decisions** in organizations. Getting a group together in **one** place and at one time can be **difficult** and **expensive**.
- Attempts to **improve** the work of groups with the **aid** of information technology have been described as collaborative computing systems, **groupware**, **electronic meeting** systems, ..
- Most groupware currently **runs** over the **Web** and provides both **video conferencing** and **audio conferencing**.

## 1.9 Enterprise Information Systems (EIS)

EIS **evolved** from executive information systems combined with **Web** technologies. EIS give **access** to relevant enterprise-wide information that **individuals** need to perform their tasks.

1. Provide an organizational **view** of operations
2. Provide an **extremely user-friendly-interface** through portals, sometimes compatible with individual **decision styles**
3. **Provide timely** and **effective corporate** level tracking and control
4. **Provide quick access** to detailed information behind text, numbers, or graphics through drill-down
5. **Filter, compress,** and track **critical data** and **information**
6. **Identify** problems (**opportunities**)

## 1.10 Knowledge Management Systems

1. The **knowledge accumulated** in organizations over time can be used to **solve** identical or **similar** problems.
2. There are several important issues to address:
  - **where** to find knowledge, how to **classify** it, how to **ensure** its quality, how to **store** it, how to **maintain** it, and how to **use** it.
3. When people **leave** an organization, they **take** their knowledge with them.
4. Knowledge is **organized** and **stored** in a knowledge **repository**, a kind of **textual** database. When a problem has to be **solved**, or an opportunity to be **assessed**, the relevant knowledge can be **found** and **extracted** from the **knowledge repository**.

## 1.10 Knowledge Management Systems

- KMS have the potential to dramatically **leverage** (influence) knowledge use in an organization.
- Knowledge management systems can be **used** to support decision-making in **several ways**, including allowing employees direct **access to usable** knowledge and to people **who** have the knowledge.

## 1.11 Expert Systems

- Expert systems attempt to **mimic human experts'** problem-solving abilities
- When an organization has a **complex** decision to make or a problem to solve, **select** an experts for advice.
- The **experts** have **specific knowledge** and **experience**. They are aware of the **alternatives**, the chances of **success**, and the **benefits** and **costs** the business may incur (bear).
- What equipment **to buy**, **mergers** and **acquisitions**, major problem diagnostics in the field, and advertising strategy.

## 1.11 Expert Systems

- The more **unstructured** the situation, the more specialized (and expensive) the advice it.
- Typically, an expert system (ES) is a decision-making or problem-solving software **package** that can **reach a level** of performance comparable to human expert in some specialized and usually narrow problem area.
- Expertise is **transferred** from the **expert to a computer**



## 1.12 Artificial Neural Networks

- The application of the technologies mentioned previously was based on the use of **explicit data**, **information**, or **knowledge** stored in a computer and manipulated as needed
- In the **complex** real world we may **not have** explicit data, information, or knowledge. People often must make decisions based on **partial**, **incomplete**, or **inexact** information. Such conditions are created in **rapidly** changing environments.
- When the approach to **problem-solving** is **computerized**, we call it **machine learning**, and its primary **tools** are artificial neural networks (**ANN**) and case-based **reasoning**.
- Neural computing, or an artificial neural network (ANN), **uses** a **pattern-recognition** approach to problem-solving, and they have been **employed** successfully in many **business applications**.

## 1.12 Artificial Neural Networks

- Several **exciting** technologies that assist decision-makers, such as **genetic algorithms**, **fuzzy logic**, and **intelligent agents** (IA).
- Genetic algorithms solve problems in an **evolutionary way**. They **mimic** the process of evolution and **search for an extremely** good solution.
- Fuzzy logic approaches problems the **way people do**. It can handle the **imprecise** nature of how humans communicate information. For example, you might say,
  - "**The weather is really hot!**" on a hot day. Consider **how hot is hot?** Would one degree cooler still be *really hot*, or simply *hot*? This **imprecision** can be handled mathematically in a precise way to assist decision-makers in solving problems.

**Intelligent** agents help in **automating** various tasks, **increasing** productivity and quality. Most intelligent systems include expert systems or another intelligent component.

## 1.14 Hybrid Support Systems

- Machine repair provides a useful **analogy**. The repair technician **diagnoses** the problem and **identifies** the **best tools** to make the repair. Although **only one tool** may be sufficient, it is often necessary to use **several tools** to improve results.

A **problem-solver** can employ **several tools in different** ways, such as:

- Use each tool **independently** to solve different aspects of the problem.
- Use several **loosely** integrated tools.
- Use several **tightly** integrated tools (e.g., a fuzzy neural network). From the user's standpoint, the tool appears as **one hybrid** system .

## 1.14 Hybrid Support Systems

- To performing **different tasks** in the problem-solving process, tools can **support each other**.
- For example, an **expert** system can **enhance** the **modeling** and **data management** of a DSS.
- **Expert** systems and **artificial** neural networks play an **increasingly** important **role** in enhancing other **MSS** technologies by making them *smarter*

# Emerging Technologies And Technology Trends

- A number of emerging (developed) technologies directly and indirectly **influence decision support systems**
- As technology advances, the speed of **computation increases**, leading to **greater** computational capability, while the physical **size** of the computer **decreases**.
- Include **grid** computing, **rich client interfaces**, model-driven architecture, **wireless computing**, and agents, algorithms, and heuristics.
- Gartner Inc. (Anonymous, 2002) **recommends** that enterprises in an **economic slowdown** select technologies that support their **core** business initiatives.

# Emerging Technologies And Technology Trends

Gartner's **four** emerging-technology trends to watch:

- 1. *Customer self-service*.** By 2005, it is expected that more than 70 percent of customer-service **interaction** for information and remote transactions will be **automated**.
  - high returns on **investment**,
  - better customer **reach**, and improved service **quality**.
  - Increased **competitiveness** and
  - **savings** that can be passed on to customers.
- 2. *Web services*.** Firms want a Web presence. Regardless of your industry, there is **some aspect** of what you do that can and should be put onto an **e-commerce Web site**.

# Emerging Technologies And Technology Trends

Gartner's four emerging-technology trends to watch:

- 3. *Wearable computers.*** By 2007, more than 60 percent of the U.S. population **wear a wireless** computing and communications device at **least six hours a day.**
- 4. *Tagging the world.*** Tags contain **information** and opinions about purchasable items. Help **buyers** find, **prioritize**, and **select** items.