



Introduction to Systems Analysis and Design

Text Book: System Analysis and Design
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Types of Systems

I. Physical or Abstract System

- Physical system: tangible entities
- static or dynamic in nature.
- Example : system-computer centre
 - Desks and chairs are the static parts
 - Programs, data, and applications can change according to the user's needs.
- Abstract systems are conceptual. These are not physical entities. They may be formulas, representation or model of a real system.


2.Open Closed System- Majority of systems are open systems

- open system has many interfaces with its environment
- can also adapt to changing environmental conditions
- can receive inputs from, and delivers output to the outside of system

Closed systems: Systems that don't interact with their environment. Closed systems exist in concept only.

3.Man made Information System

- Information system is the basis for interaction between the user and the analyst.
- **Main purpose**-manage data for a particular organization.
- Further Categorized as:
 - Formal Information Systems:
 - Responsible for flow of information from top management to lower management
 - But feedback can be given from lower authorities to top management.

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- Informal Information Systems:
 - Informal systems are employee based.
 - These are made to solve the day to day work related problems.
 - Computer-Based Information Systems:
 - This class of systems depends on the use of computer for managing business applications

I. Formal Information system

Management and information levels in an organization:

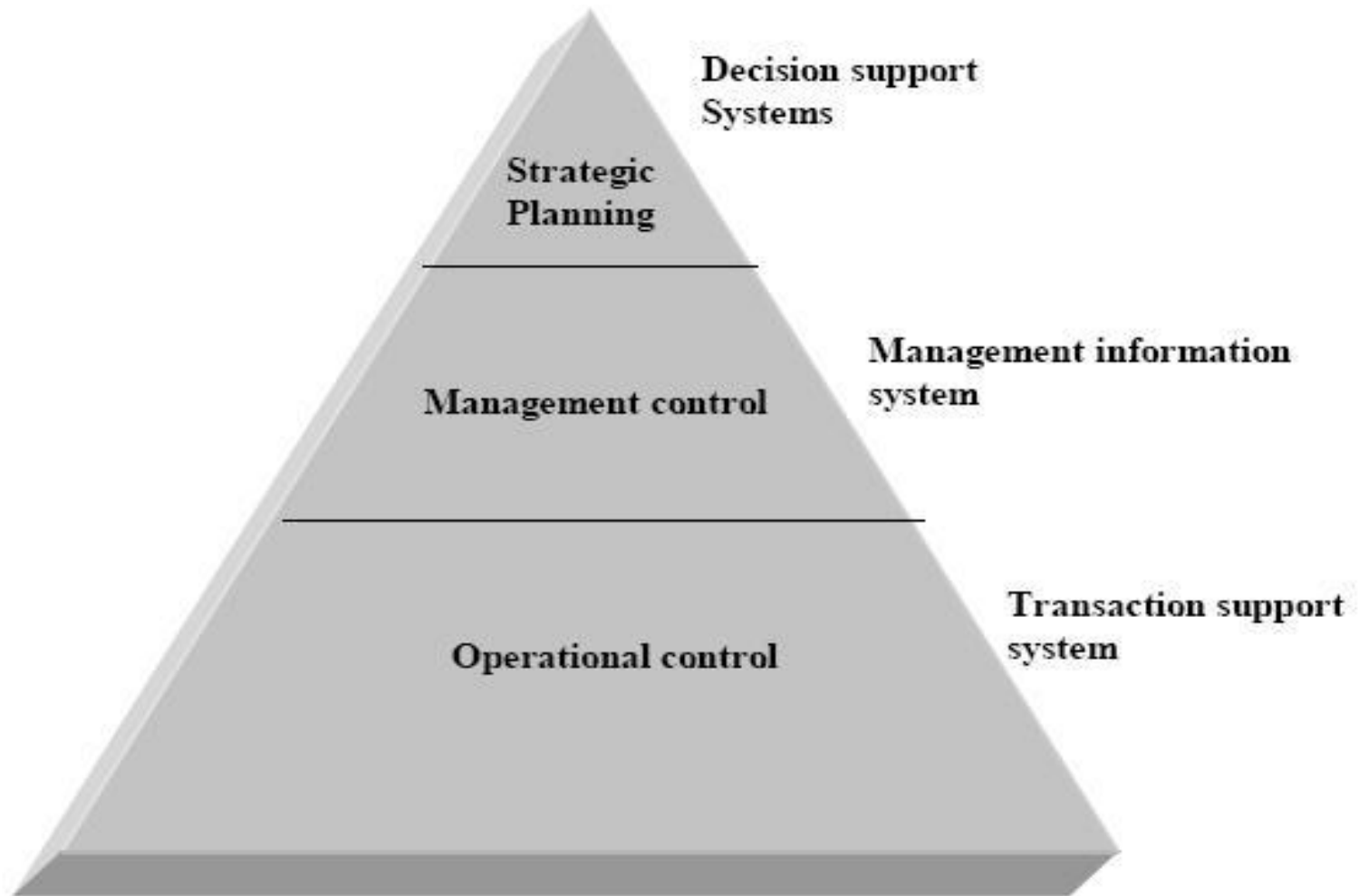


Fig 1.2

Relation of information systems to levels of organization

Categories of information:

- Information can be categorized as:
 - strategic information
 - managerial information
 - operational information.

Strategic information

- Strategic information is the information needed by top most management for decision making.
- This information is not required by the lower levels in the organization.
- The information systems that provide these kinds of information are known as Decision Support Systems (DSS).
- For example the trends in revenues earned by the organization are required by the top management for setting the policies of the organization.

Managerial information

- required by the middle management
- used for making short term decisions and plans for the organization
- Management information system (**MIS**) caters to such information needs of the organization.
- Information like sales analysis for the past quarter or yearly production details etc. fall under this category.

Operational information

- relating to the daily or short term information needs of the organization such as attendance records of the employees.
- This kind of information is required at the operational level for carrying out the day-to-day operational activities.
- The information system is known as Transaction Processing System (**TPS**) or Data Processing System (**DPS**).
- Some examples of information provided by such systems are processing of orders, posting of entries in bank, evaluating overdue purchaser orders etc.

2. Informal Information system

- “The system of relationships and lines of authority that develops spontaneously as employees meet; that is the human side of the organization.

Basic Characteristics:

- Involves two or more people
- Informal relationships, **groupings** & interactions
- Involves the human need to socialize
- Includes both friendly and hostile relationships and interactions


3. Computer based information systems

a) Transaction Processing Systems or Data Processing Systems

- TPS processes business transaction of the organization.
- Transaction can be any activity of the organization.
- Transactions differ from organization to organization.
- For example, take a railway reservation system. Booking, canceling, etc are all transactions.
- Any query made to it is a transaction.
- Transaction processing systems provide speed and accuracy, and can be programmed to follow routines functions of the organization.

b)Management Information Systems

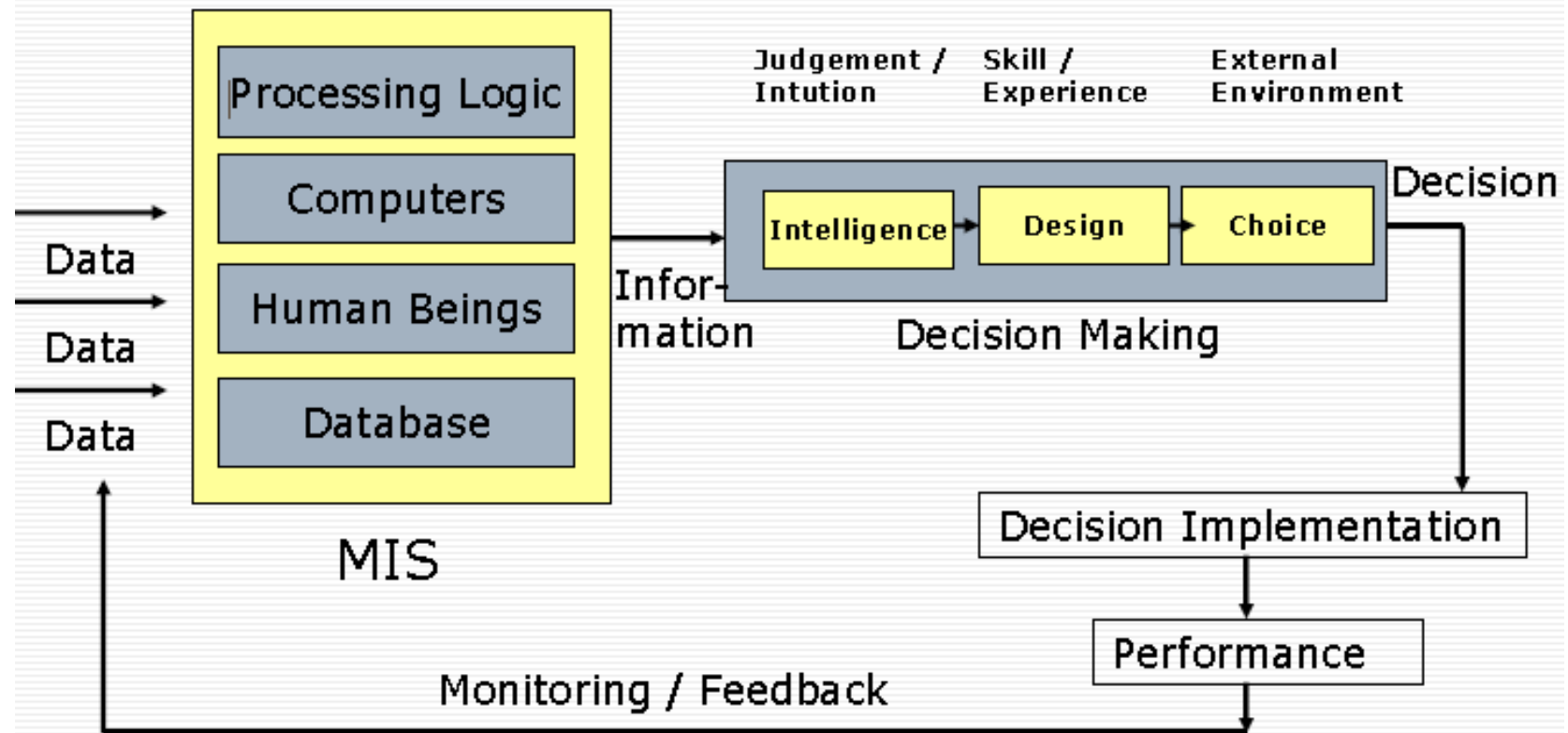
- These systems assist lower management in problem solving and making decisions.
- They use the results of transaction processing and some other information also.
- An important element of MIS system is database.
- And the information is accessed through DBMS.
- But there are two drawbacks of database i.e. requirement of a specialized personnel and need to secure data from unauthorized access.



The three sub-components:

- **System** emphasizing a fair degree of integration and a holistic view;
- **Information** stressing on processed data in the context in which it is used by end users;
- **Management** focusing on the ultimate use of such information systems for managerial decision making.

The Concept of MIS



Components of MIS


Five-Component Framework



- Hardware—desktops, laptops, PDA s
- Software—operating systems, application programs
- Data—facts and figures entered into computers
- Procedures—how the other four components are used
- People—users, technologists, IS support

c) Decision Support Systems


- These systems assist higher management to make long term decisions.
- These type of systems handle unstructured or semi structured decisions.
- A decision is considered unstructured if
 - there are no clear procedures for making the decision and
 - if not all the factors to be considered in the decision can be readily identified in advance.
- The user should be able to produce customized reports by giving particular data and format specific to particular situations.

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- **Three fundamental components of a DSS architecture are:**
 - ❑ **the database** (or knowledge base).
 - ❑ **the model** (i.e., the decision context and user criteria), and
 - ❑ **the user interface.**
 - The **users** themselves are also important components of the architecture.

Classification of DSS

- Using the relationship with the user as the criterion:
 - ❑ **A *passive DSS*** is a system that aids the process of decision making, but that cannot bring out explicit decision suggestions or solutions.
 - ❑ **An *active DSS*** can bring out such decision suggestions or solutions.
 - ❑ **A *cooperative DSS*** allows the decision maker (or its advisor) to modify, complete, or refine the decision suggestions provided by the system, before sending them back to the system for validation.

- **Using the mode of assistance as the criterion :**
 - ❑ A **communication-driven DSS** supports more than one person working on a shared task; examples include integrated tools like Microsoft's NetMeeting or Groove.
 - ❑ A **data-driven DSS** or data-oriented DSS emphasizes access to and manipulation of a time series of internal company data and, sometimes, external data.
 - ❑ A **document-driven DSS** manages, retrieves, and manipulates unstructured information in a variety of electronic formats.

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- ❑ A **knowledge-driven DSS** provides specialized problem-solving expertise stored as facts, rules, procedures, or in similar structures.
 - ❑ A **model-driven DSS** emphasizes access to and manipulation of a statistical, financial, optimization, or simulation model.
 - ❑ Model-driven DSS use data and parameters provided by users to assist decision makers in analyzing a situation; they are not necessarily data-intensive

Basic Principles of a successful system

- System should be of use for the user.
- Ready in time.
- Visible benefits
- Maintained effectively
- Well documented.

Man Made and Automated systems

Man-made systems

- Man-made systems include such things as:
 1. **Social systems:** organizations of laws, doctrines, customs, and so on.
 2. An organized, disciplined collection of ideas.
 3. **Transportation systems:** networks of highways, canals, airlines and so on.
 4. **Communication systems:** telephone, telex, and so on.
 5. **Manufacturing systems:** factories, assembly lines, and so on.
 6. **Financial systems:** accounting, inventory, general ledger and so on.
- Most of these systems include computers today.


Automated systems:

- Some information processing systems may not be automated because of these common reasons:
 - Cost; Convenience; Security; Maintainability; Politics.

Automated systems are the man-made systems that interact with or are controlled by one or more computers.

We can distinguish many different kinds of automated systems, but they all tend to have **common components**:


1. Computer hardware (CPUs, disks, terminals, and so on).
2. Computer software: system programs such as operating systems, database systems, and so on.

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3. People: those who operate the system, those who provide its inputs and consume its outputs, and those who provide manual processing activities in a system.
 4. Data: the information that the system remembers over a period of time.
 5. Procedures: formal policies and instructions for operating the system.

Real-Life business sub system

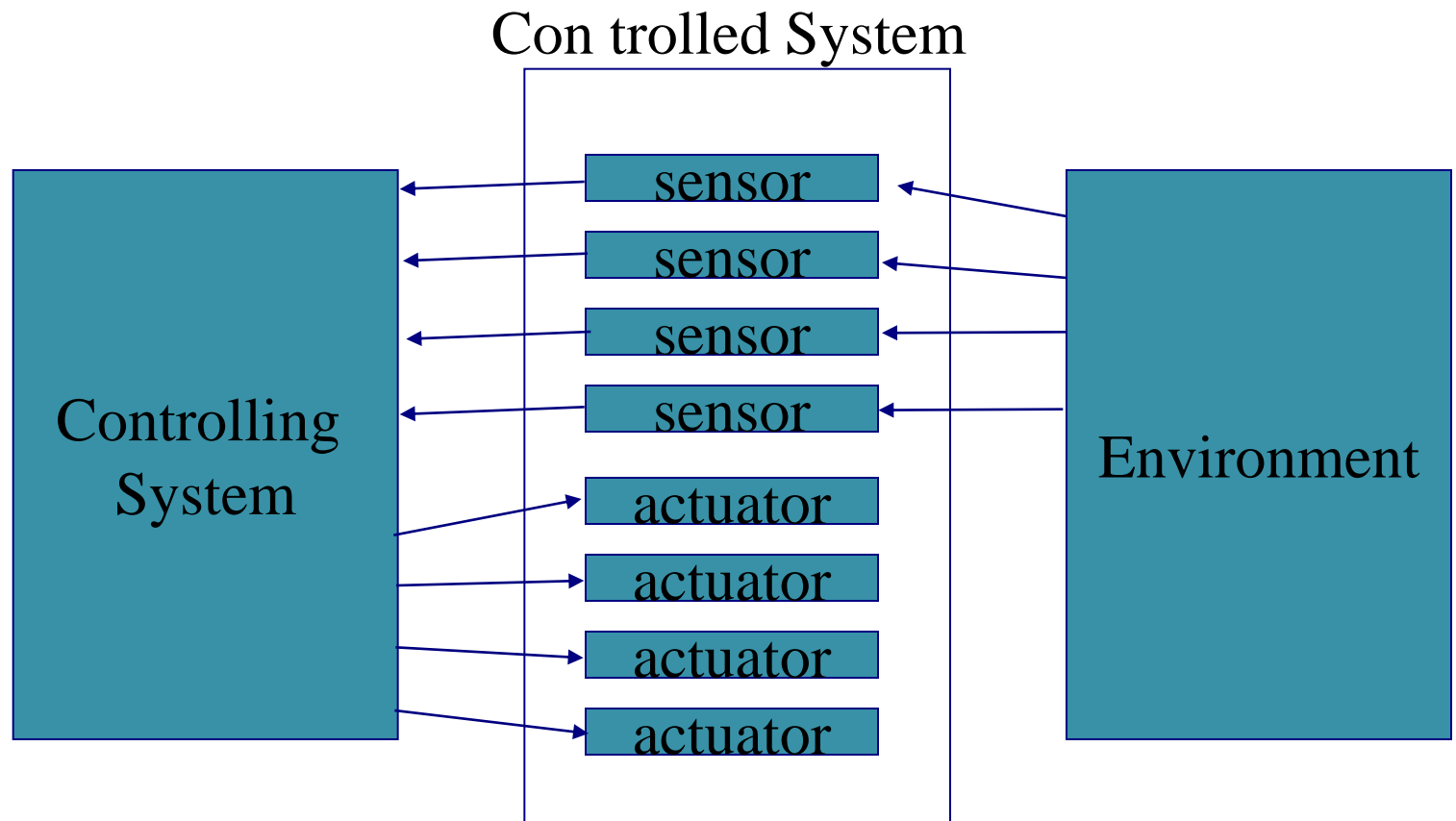
I. Production sub system:

- Related to production of goods and services.
- Main problems involved are:
 - Plant Location
 - Plant layout
 - Production policy(how much unit has to be produced)
 - Purchase and inventory control.
 - Production planning and control
 - Quality and cost control.

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2. Materials Management sub system
 - Purchase of material(quality and cost)
 - Storage and handling of material.
 3. Financial Management sub system
 - Proper utilization of funds
 - Various issues involved like dividend policy etc.
 4. Personnel Management sub system
 - Deals with people at work
 - Planning man-power
 - Recruitment
 - HR policies
 5. Marketing Management sub system
 - Marketing strategies
 - Increasing the sales and thus the profit.

Real-Time system

- Real-time systems have been defined as: "those systems in which the correctness of the system depends not only on the logical result of the computation, but also on the **time** at which the results are produced"
- Real-time systems often are comprised of a
 - *Controlled system*
 - *environment.*
 - Controlling system: acquires information about environment using sensors and controls the environment with actuators.



Hard versus soft real time system


- **Hard:** failure to meet constraint is a fatal fault.
- Validation system always meets timing constraints.
 - Deterministic constraints
 - Probabilistic constraints
 - Constraints in terms of some usefulness function.
- **Soft:** late completion is undesirable but generally not fatal.
- No validation or only demonstration job meets some statistical constraint.
- Occasional missed deadlines or aborted execution is usually considered tolerable.
- Often specified in probabilistic terms

Distributed system

- A distributed system is a collection of independent computers that appear to the users of the system as a single system.
- Examples:
 - Network of workstations
 - Distributed manufacturing system (e.g., automated assembly line)
 - Network of branch office computers

Advantages of Distributed Systems

- **Economics:** cost effective way to increase computing power.
- **Speed:** a distributed system may have more total computing power than a mainframe.
- Ex. 10,000 CPU chips, each running at 50 MIPS. Not possible to build 500,000 MIPS single processor since it would require 0.002 nsec instruction cycle.
- **Reliability:** If one machine crashes, the system as a whole can still survive. Higher availability and improved reliability.
- **Incremental growth:** Computing power can be added in small increments. Modular expandability

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- **Data sharing:** allow many users to access to a common data base
 - **Resource Sharing:** expensive peripherals like color printers
 - **Communication:** enhance human-to-human communication, e.g., email, chat
 - **Flexibility:** spread the workload over the available machines

Disadvantages of Distributed Systems

- **Software:** difficult to develop software for distributed systems
- **Network:** saturation, lossy transmissions
- **Security:** easy access also applies to secrete data