Information System Analysis and Design

Course no: CSE 4109

Chapter 1

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✅ What is a System?

- A **system** is a set of **interrelated components** working together toward a **common goal** by accepting inputs, processing them, and producing outputs.
- **Example**: A **banking system** takes customer deposits (input), processes transactions, and updates account balances (output).

🔷 Elements of a System

- **Input**
  - Data or material received for processing
  - *Example: Sales orders*
- **Process**
  - The transformation of input into output
  - *Example: Calculating total price and taxes*
- **Output**
  - The final result or product of a system
  - *Example: Invoice or receipt*
- **Control**
  - Guides the system to achieve desired objectives
  - *Example: Security checks or approval mechanisms*

🔷 Elements of a System

- **Feedback**
  - Output data used to adjust or improve the system
  - *Example: Error messages or performance reports*
- **Environment**
  - External factors that affect the system
  - *Example: Market conditions, regulations*
- **Boundary**
  - Defines what is inside and outside the system

Characteristics of a System

- **Organization**
  - Structured and coordinated arrangement of elements
- **Interaction**
  - Elements interact with each other (e.g., input leads to processing)
- **Interdependence**
  - Elements depend on each other for proper functioning
- **Integration**
  - Elements work together to achieve a common goal
- **Goal-oriented**
  - Every system has a specific objective or function
- **Feedback Mechanism**
  - Monitors output and helps refine processes

🔰 Types of Systems

- **1. Physical vs. Abstract**
- 🔹 **1. Physical System**
- Tangible, concrete
- Made of physical components
- Can be touched or seen
- **Example**:
- Computer hardware
- Human body
- Car engine

🔰 Types of Systems

- 🔹 **2. Abstract System**
- Conceptual or theoretical
- Cannot be physically touched
- Used for thinking, planning, and designing
- **Example**:
- Mathematical equations
- Business process model
- Software algorithms

🔰 Types of Systems

- 🔹 **3. Open System**
- Interacts with the external environment
- Takes input and gives output
- Adapts to external changes
- **Example**:
- School system (receives students, sends graduates)
- E-commerce system (receives orders, delivers products)

🔰 Types of Systems

Characteristic of an open system	Description
🔄 **Interaction with Environment**	Continuously receives inputs and sends outputs to/from the environment.
🧠 **Adaptability**	Responds and adjusts to changes in the external environment (e.g., market, laws).
📈 **Growth and Evolution**	Can evolve, improve, or expand based on feedback and changing needs.
🔁 **Feedback Mechanism**	Receives feedback from output or environment to improve future performance.
🧩 **Interdependence**	Subsystems within the open system depend on each other and on external components.
🌍 **Influenced by External Factors**	Affected by political, economic, technological, legal, and social forces.
🛠️ **Flexible and Dynamic**	Capable of changing its processes, rules, or resources to stay relevant.
📤 **Export and Import of Resources**	Uses resources (data, materials, energy) from outside and produces outputs back to the environment.

🔰 Types of Systems

- 🏢 **Example: Organization as an Open System**
- **Inputs**: Raw materials, labor, information
- **Processes**: Manufacturing, service delivery, decision-making
- **Outputs**: Products, services, reports
- **Feedback**: Customer satisfaction, sales data
- **Environmental Factors**: Competition, regulations, economy

🔰 Types of Systems

- 🔹 **4. Closed System**
- Does not interact with external environment (theoretical only)
- Self-contained
- No input/output exchange
- **Example**:
- Chemical reaction in a sealed container
- Clock (basic operation)
- *Note: Most real-world systems are **open**, not completely closed.*

🔰 Types of Systems

- 🔹 **5. Deterministic System**
- Predictable output for a given input
- Operates with known rules
- No randomness
- **Example**:
- Calculator
- Payroll system
- ATM machine

🔰 Types of Systems

- 🔹 **6. Probabilistic System**
- Outcome is not always predictable
- Includes randomness or uncertainty
- Uses probability/statistics
- **Example**:
- Stock market
- Weather forecasting system
- Online recommendation system

🔰 Types of Systems

- 🔹 **7. Man-made System**
- Designed and created by humans
- Built for specific goals
- **Example**:
- Railway system
- Computer-based information system
- Traffic light system

🔰 Types of Systems

- 🔹 **8. Natural System**
- Created by nature
- Exists without human interference
- **Example**:
- Solar system
- Ecosystem
- Water cycle

🔰 Types of Systems

Type	Key Characteristics	Example
Physical	Tangible, hardware-based	Computer, Car engine
Abstract	Conceptual, logic-based	Software, Math formulas
Open	Interacts with environment	School, Hospital
Closed	No external interaction	Sealed lab experiment
Deterministic	Predictable, rule-based	Calculator, Billing system
Probabilistic	Uncertain, chance-based	Weather system, Lottery system
Man-made	Built by humans for specific purposes	Railway, ERP system
Natural	Exists in nature	Human body, Solar system

✅ Categories of Information

- 🔹 **1. Strategic Information**
- **Purpose**: Long-term planning and decision-making
- **Users**: Top-level management (e.g., CEO, directors)
- **Nature**: Summarized, forecasted, external/internal
- **Frequency**: Periodic or on-demand
- **Example**:
- Market trends
- Investment plans
- Competitor analysis
- New product development strategy

✅ Categories of Information

- 🔹 **2. Tactical (Managerial) Information**
- **Purpose**: Medium-term planning and control
- **Users**: Middle-level managers (e.g., department heads)
- **Nature**: Detailed but less than operational, mostly internal
- **Frequency**: Weekly or monthly reports
- **Example**:
- Sales performance report
- Budget allocation
- Human resource planning

✅ Categories of Information

- 🔹 **3. Operational Information**
- **Purpose**: Day-to-day activities and decision-making
- **Users**: Operational-level employees or supervisors
- **Nature**: Highly detailed, mostly internal
- **Frequency**: Daily or real-time
- **Example**:
- Attendance records
- Transaction logs
- Inventory levels
- Daily work schedules

✅ Categories of Information

- 🔹 **4. Statutory Information**
- **Purpose**: Legal and regulatory compliance
- **Users**: Government, auditors, legal authorities
- **Nature**: Structured, formal, and mandatory
- **Frequency**: Periodic (monthly, quarterly, yearly)
- **Example**:
- Tax reports
- Financial statements (for audit)
- Environmental compliance data

✅ Categories of Information

- 🔹 **5. Financial Information**
- **Purpose**: Budgeting, financial planning, profitability
- **Users**: Managers, accountants, investors
- **Nature**: Numerical, quantitative
- **Frequency**: Monthly/Quarterly/Annually
- **Example**:
- Profit and loss statement
- Balance sheet
- Cost analysis report

✅ Categories of Information

- 🔹 **6. Non-financial Information**
- **Purpose**: Support decision-making without direct financial figures
- **Users**: HR, marketing, operations
- **Nature**: Qualitative or descriptive
- **Frequency**: As needed
- **Example**:
- Employee satisfaction data
- Customer feedback
- Product quality rating

✅ Categories of Information

- **7. Internal vs. External Information**

Type	Description	Example
Internal	Originates inside the organization	Sales report, employee data
External	Comes from outside sources	Market trends, government policies

✅ Categories of Information

Category	Users	Purpose	Example
Strategic	Top managers	Long-term goals	Business expansion plans
Tactical	Middle managers	Departmental planning	Resource allocation
Operational	Frontline staff	Daily operations	Inventory levels, task logs
Statutory	Govt./Regulators	Compliance	Tax returns, audit reports
Financial	Managers, Investors	Profit and budgeting	Income statement, budgets
Non-financial	HR, Marketing	Non-monetary decision support	Feedback, quality data
Internal	Inside stakeholders	Organization-focused	Sales data, HR records
External	Outside stakeholders	Industry insight, regulation	Market research, legal rules

📘 1. Information System (IS)

- ✅ **Definition:**
- An **Information System** is a set of **interrelated components** that collect, process, store, and distribute **information** to support **decision-making**, coordination, control, analysis, and visualization in an organization.
- 🔧 **Functions of an Information System:**
- Input (data collection)
- Processing (convert data to useful form)
- Storage (save data for future use)
- Output (generate reports, decisions)
- Feedback (improve system performance)

📘 1. Information System (IS)

- 🧩 **Components of IS:**
- **Hardware** – physical devices (computers, servers)
- **Software** – programs and applications
- **Data** – raw facts and figures
- **People** – users and IT staff
- **Processes** – steps to achieve business goals
- **Example**: A library management system records borrowed books, tracks due dates, and alerts users.

💻 2. Computer-Based Information System (CBIS)

- ✅ **Definition:**
- A **Computer-Based Information System** is an **information system that uses computer technology** to perform some or all of its tasks. It automates manual processes and improves the speed and accuracy of data handling.
- 🔧 **Main Components (same as IS, but technology-focused):**
- **Hardware**: computers, networking devices
- **Software**: databases, applications
- **Database**: structured data storage
- **Telecommunications**: networking systems
- **People**: end users, IT professionals
- **Procedures**: rules and instructions for system use

💻 2. Computer-Based Information System (CBIS)

- 📁 **Types of CBIS:**
- **Transaction Processing Systems (TPS)**
- **Management Information Systems (MIS)**
- **Decision Support Systems (DSS)**
- **Expert Systems (ES)**
- **Enterprise Systems (ERP, CRM)**
- **Example**: Online banking system that processes transactions, shows account balances, and sends notifications.

📊 3. Decision Support System (DSS)

- ✅ **Definition:**
- A **Decision Support System** is a type of **CBIS** designed to help managers **make decisions** by analyzing large volumes of data and offering useful insights.
- 🔧 **Key Features:**
- Supports **semi-structured** or **unstructured** decisions
- Uses analytical models and data analysis tools
- Offers **“what-if” analysis**, forecasting, and simulations
- Provides **interactive interface** for user control

📊 3. Decision Support System (DSS)

- 🧩 **Components:**
- **Database** – stores relevant internal/external data
- **Model Base** – contains statistical, mathematical, or simulation models
- **User Interface** – allows users to interact with the system
- **Example**: A sales manager uses DSS to analyze customer trends and forecast next quarter sales using graphical dashboards and reports.

Summary table

Feature	Information System (IS)	Computer-Based IS (CBIS)	Decision Support System (DSS)
Purpose	Manage information flow	Automate info systems with computers	Help in decision-making
Technology	May/may not use computers	Always uses computers	Specialized type of CBIS
User	General staff & management	All organization levels	Managers, Analysts
Decision Type	Operational, general	Operational to strategic	Semi/unstructured decisions

Thank you!