

**INTERNATIONAL ADVANCED LEVEL**

**INFORMATION TECHNOLOGY**

**UNIT 1**

**Topic 4 – IT Systems**



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## 1.0 IT Systems

An **IT system** is an integrated collection of **hardware, software, processes, and people** designed to meet the operational and strategic needs of an organization. IT systems are used to store, process, and communicate information efficiently. IT systems are pervasive and crucial for various organizational functions. They support:

- **Stock Control:** Ensuring that inventory levels are maintained and replenished as needed.
- **Booking:** Managing appointments, reservations, or ticketing.
- **Asset Management:** Tracking and maintaining physical and digital assets.
- **Logistics:** Coordinating transportation, warehousing, and distribution of goods.

### 1.1.0 Examples of IT Systems in Organizations:

1. **Retail:** POS (Point of Sale) systems, inventory management software.
2. **Logistics:** GPS tracking, supply chain management systems.
3. **Finance:** Online banking platforms, fraud detection systems.
4. **Healthcare:** Electronic Health Records (EHR), patient management systems.
5. **Education:** Learning Management Systems (LMS), virtual classrooms

### 1.2.0 Importance of IT Systems:

- **Improves Efficiency:** Automates repetitive tasks and enhances productivity.
- **Enhances Decision-Making:** Provides real-time data analysis and reporting.
- **Ensures Data Security:** Protects sensitive information from cyber threats.
- **Supports Communication:** Enables seamless collaboration through emails, cloud storage, and video conferencing.
- **Facilitates Innovation:** Supports business growth through emerging technologies like AI and cloud computing.

### 1.3.0 Conventional Notation in IT Systems:

- **Flowcharts:** Used to represent processes and decision-making steps.
- **Entity-Relationship Diagrams (ERD):** Helps in database design and management.

- **Network Diagrams:** Illustrates the structure of computer networks.

## 2.0 Systems Design

An **IT system** is an integrated collection of **hardware, software, processes, and people** designed to meet the operational and strategic needs of an organization. IT systems are used to store, process, and communicate information

### 2.1.0 Concept of IT System:

An IT system is an integrated set of components designed to support the information needs of an organization. It comprises four main components:

1. **Hardware:**
  - Physical devices that support the system (e.g., computers, servers, networking equipment).
2. **Software:**
  - Programs and operating systems that run on the hardware.
3. **Processes:**
  - Procedures, workflows, and protocols that govern system operations.
4. **People:**
  - Users, IT professionals, and stakeholders who interact with and manage the system

### 2.2.0 Decomposing Systems

- **Breaking Down Complexity:**
  - A complex system can be divided into smaller, manageable sub-systems and components.
  - This decomposition helps in understanding, designing, and troubleshooting the overall system by focusing on individual parts before integrating them.

## Designing IT Systems

- **Conventional Symbols:**

- A standard notation to represent components in a system design.
- **Examples:**
  - Rectangles for processes, cylinders for databases, arrows for data flow.

### Example Diagram:

[User Input] ---> [Order Processing] ---> ○ Customer Database

↳ [Payment Processing] ---> ○ Payment Database

- **Design Process:**

- Identify all components.
- Decompose the system into sub-systems.
- Use conventional symbols to create a clear diagram that maps out the entire system.

## Demonstration/Example

- **Real-World Case:**

- **Example:** A booking system for a small hotel.
  - **Decomposition:**
    - **Hardware:** Computers, servers, networking devices.
    - **Software:** Reservation management software, operating system.
    - **Processes:** Booking, payment processing, room allocation.
    - **People:** Receptionists, IT support, customers.
  - **Design:**

[User Interface] ---> [Booking System] ---> ○ Reservation Database

↳ [Payment Gateway] ---> ○ Payment Processing System

### 3.0 Dataflow Diagrams

A **Dataflow Diagram (DFD)** visually depicts how information moves through a system—where data originates, how it's processed, and where it ends up. DFDs are essential because they:

1. **Simplify Complexity:** Break down large systems into understandable components.
2. **Clarify Roles and Responsibilities:** Show which entities (people, departments, or external systems) interact with the system.
3. **Identify Potential Bottlenecks:** Help spot inefficiencies in data handling or processing.

### Interpreting and Creating Dataflow Diagrams

#### Symbols from Appendix 7

##### 1. Data Source or Destination (Inputs and Outputs) – Oval

- **Meaning:** Represents external entities outside the system boundary (e.g., customers, suppliers, or other systems).
- **Example:** A *Customer* submitting an order.

##### 2. Duplication Data Source or Destination – Oval

- **Meaning:** Used when the same entity appears multiple times in the diagram (to keep it uncluttered).
- **Example:** A *Customer* entity that appears in more than one part of the diagram.

##### 3. Process – Rectangle

- **Meaning:** An activity or function that transforms incoming data into outgoing data.
- **Example:** *Order Processing, Payment Verification.*

##### 4. Data Store – Open-Ended Rectangle

- **Meaning:** A repository where data is held (e.g., a database, a file, or a ledger).
- **Example:** *Orders Database, Inventory File.*

##### 5. Data Flow – Arrow

- **Meaning:** Shows the movement of data between entities, processes, or data stores. Arrows are usually labeled to describe the type of data.
- **Example:** *Order Details, Payment Confirmation.*

## Information Flow Symbols

- A labeled arrow from **Source A** to **Destination B** indicating what data or information is being transferred.

## Demonstration

### Example Scenario: Online Order System

#### 1. Data Source (Oval):

- *Customer* (submits orders).

#### 2. Processes (Rectangle):

- *Order Submission* (receives order details).
- *Payment Processing* (verifies and processes payments).

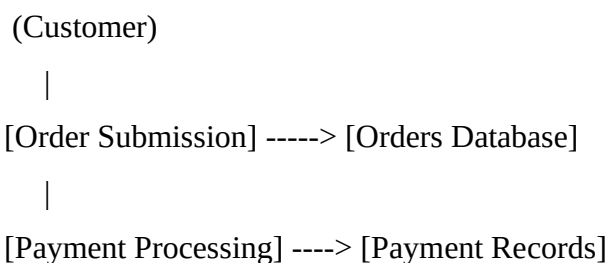
#### 3. Data Stores (Open-Ended Rectangle):

- *Orders Database* (stores all order information).
- *Payment Records* (stores payment transaction details).

#### 4. Data Flows (Arrows):

- *Customer* → *Order Submission*: “Order Details”
- *Order Submission* → *Orders Database*: “New Order”
- *Order Submission* → *Payment Processing*: “Payment Info”
- *Payment Processing* → *Payment Records*: “Payment Confirmation”

A simple DFD might look like this:



## Hands-On Exercise

**Scenario:** A stock control system in a retail environment.

**1. Identify External Entities (Ovals):**

- *Suppliers, Store Manager.*

**2. Determine Processes (Rectangles):**

- *Inventory Update, Stock Order Processing, Low Stock Alert.*

**3. List Data Stores (Open-Ended Rectangles):**

- *Inventory Database, Order Records.*

**4. Label Data Flows (Arrows):**

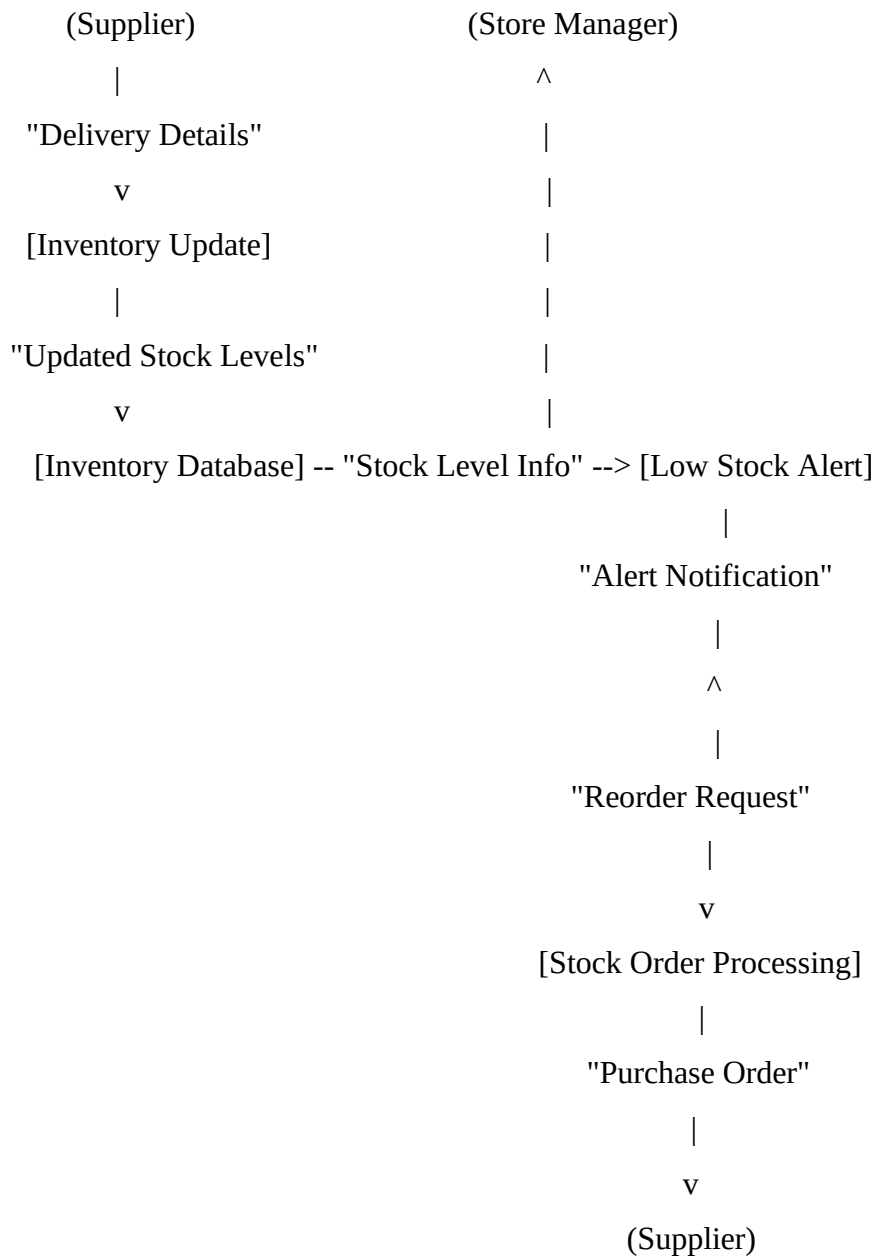
- *Supplier → Inventory Update: “Delivery Details”*
- *Inventory Update → Inventory Database: “Stock Level Changes”*
- *Low Stock Alert → Stock Order Processing: “Reorder Request”*

### Task:

Using the **Appendix 7** symbols:

- Draw a DFD illustrating how data moves among these entities, processes, and data stores.
- Label each arrow to indicate the data being transferred.
- Ensure your diagram is clear, showing how suppliers provide stock data and how the store manager interacts with the system.

Below is a **Dataflow Diagram (DFD)** for a **stock control system** in a retail environment. It uses the **Appendix 7 symbols** (described in your reference image) to show how data moves among **external entities**, **processes**, and **data stores**. Each arrow is labeled to indicate the type of data flowing through the system.



## Explanation of Each Element

### 1. External Entities (Ovals)

- **(Supplier):** Provides delivery details for new stock and receives purchase orders when items need restocking.
- **(Store Manager):** Receives alert notifications when stock is low.

### 2. Processes (Rectangles)

- **[Inventory Update]:** Takes delivery details from the supplier and updates the stock levels.

- **[Low Stock Alert]:** Monitors inventory data; if levels fall below a threshold, sends an alert notification to the store manager and a reorder request to the next process.
  - **[Stock Order Processing]:** Handles the creation of purchase orders to request additional stock from the supplier.
3. **Data Store (Open-Ended Rectangle)**
- **[Inventory Database]:** Stores all inventory records (e.g., item details, quantities). Processes read from and write to this data store as needed.
4. **Data Flows (Arrows)**
- **“Delivery Details”:** Information from the supplier about new stock arriving.
  - **“Updated Stock Levels”:** Data sent from the Inventory Update process to the Inventory Database.
  - **“Stock Level Info”:** Information retrieved from the Inventory Database by the Low Stock Alert process.
  - **“Alert Notification”:** Warning sent to the Store Manager indicating low stock.
  - **“Reorder Request”:** Instruction for the Stock Order Processing to create a new purchase order.
  - **“Purchase Order”:** Document sent to the supplier requesting more stock.

### How to Read This Diagram

1. **Start with the Supplier:** The supplier provides **Delivery Details** to the **Inventory Update** process.
2. **Inventory Update:** Updates the **Inventory Database** with the new stock information.
3. **Low Stock Alert:** Regularly checks the **Inventory Database** for any items below the required threshold. If an item is low, it sends an **Alert Notification** to the Store Manager and a **Reorder Request** to **Stock Order Processing**.
4. **Stock Order Processing:** Uses the reorder request to create a **Purchase Order**, which is then sent to the supplier to replenish stock.

This DFD gives a clear view of **who** (external entity) provides data, **which** process transforms or uses the data, **where** the data is stored, and **what** final output is generated.

## 4.0 Flowcharts

### Concept & Importance

- **Definition of Flowcharts:**

A **flowchart** is a **diagrammatic representation** of a process or workflow, showing each step in a logical sequence.

- **Why They Matter:**

- **Clarity:** Flowcharts make complex processes easier to understand by breaking them down into sequential steps.
- **Error Detection:** They help identify potential problems or inefficiencies in a process.
- **Communication:** Flowcharts act as a universal language among developers, managers, and end-users.

### Interpreting and Creating Flowcharts

Refer to **Appendix 7** for standard flowchart symbols. The most common ones include:

1. **Start/End (Terminator):**

- **Shape:** Oval or rounded rectangle.
- **Meaning:** Marks the beginning or end of a flowchart.

2. **Process (Rectangle):**

- **Meaning:** Represents an **action** or **operation** (e.g., “Calculate total,” “Update record”).

3. **Decision (Diamond):**

- **Meaning:** Indicates a **branch** in the flow based on a **yes/no** or **true/false** question (e.g., “Is payment authorized?”).

4. **Input/Output (Parallelogram):**

- **Meaning:** Used for **data entry** or **data display** (e.g., “Enter customer details,” “Display booking confirmation”).

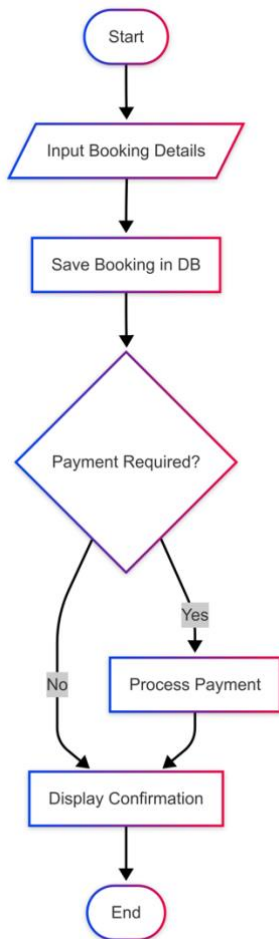
5. **Connector/Flow (Arrow):**

- **Meaning:** Shows the **direction** of the process flow from one step to another.

## Demonstration

### Example Flowchart: Booking Process

Below is a **simplified** flowchart illustrating a **booking process** in an IT system:



#### Explanation:

1. The process **starts** when a user enters booking details.
2. The system **saves** the booking information to a database.
3. A **decision** checks whether payment is required.
4. If **Yes**, the system **processes** payment and displays a confirmation.
5. If **No**, the system **skips** the payment step and displays a confirmation.
6. The process **ends**.

#### Interactive Activity

##### 1. Scenario:

Ask students to create a **flowchart** for a **product return process** in an online store:

- **Start** when a customer initiates a return.
- **Decision**: “Is the product damaged?” or “Within return window?”
- **Process**: Update return status, notify warehouse, etc.

- **End** when the process concludes (e.g., refund issued, replacement shipped).

##### 2. Instructions:

- Use the **Appendix 7** symbols correctly (start/end, process, decision, input/output).
- Ensure the flow is **logical**, with clear **Yes/No** paths for decisions.
- Label each step concisely to maintain clarity.

##### 3. Class Discussion:

- After creating their flowcharts, students can **pair up** to review each other’s diagrams, ensuring the **symbols are used properly** and the process flows logically.

## Explanation of the Flowchart

1. **Start:** Marks the beginning of the booking process.
2. **Input Booking Details:** The user enters booking information (e.g., date, time, personal info).
3. **Save Booking in DB:** The system stores these details in a database.
4. **Payment Required?:** A decision point to check if payment is needed (e.g., deposit or full amount).
5. **Yes → Process Payment:** If payment is required, the system processes it (e.g., via credit card).
6. **No → Display Confirmation:** If no payment is needed, the system skips payment and shows a confirmation.
7. **End:** Concludes the booking process.

## Evaluation of IT Systems

### Discussion Points

#### 1. Advantages & Disadvantages

- **Benefits of IT Systems:**
  - **Improved Efficiency:** Automate tasks, streamline workflows, reduce manual errors.
  - **Better Data Management:** Centralize and secure data, enable real-time updates, facilitate reporting.
  - **Enhanced Communication:** Email, instant messaging, and collaboration tools support teamwork and information sharing.
- **Potential Drawbacks:**
  - **Complexity:** Can be challenging to implement and maintain; requires skilled personnel.
  - **Cost:** Upfront expenses for hardware/software, plus ongoing support and upgrades.
  - **Security Risks:** Vulnerabilities to cyberattacks, data breaches, and unauthorized access.

## 2. Contemporary Devices

- **Modern Digital Devices:**
  - **Smartphones, Tablets, Wearables:** Provide mobile access to data and applications.
  - **Peripheral Devices:** Printers, scanners, barcode readers—extend the functionality of core systems.
- **Storage & Memory Solutions:**
  - **Solid-State Drives (SSDs):** Faster data access and improved performance compared to traditional HDDs.
  - **Cloud Storage:** Offers scalability and remote access; shifts maintenance to cloud providers.
  - **RAM (Random Access Memory):** Affects system speed; more RAM generally leads to better multitasking and performance.

## 3. Case Study Discussion

- **Example: Retail Point-of-Sale (POS) System**
  - **Key Components:** Barcode scanners, cash registers, payment terminals, inventory databases.
  - **Fitness for Purpose:**
    - **Reliability:** Does the system handle peak shopping times without crashing?
    - **Usability:** Is the interface intuitive for staff to learn and use?
    - **Scalability:** Can it easily accommodate additional registers or new store branches?
    - **Security:** Are payment details and customer data protected against breaches?

## 6. Summary and Review (5 minutes)

- **Recap Key Points:**
  - Summarize the core concepts of system design, dataflow diagrams, flowcharts, and system evaluation.
- **Q&A Session:**
  - Pose questions such as:
    - “What are the four key components of an IT system?”
    - “Why is decomposing a system important?”
    - “What is the purpose of a dataflow diagram?”