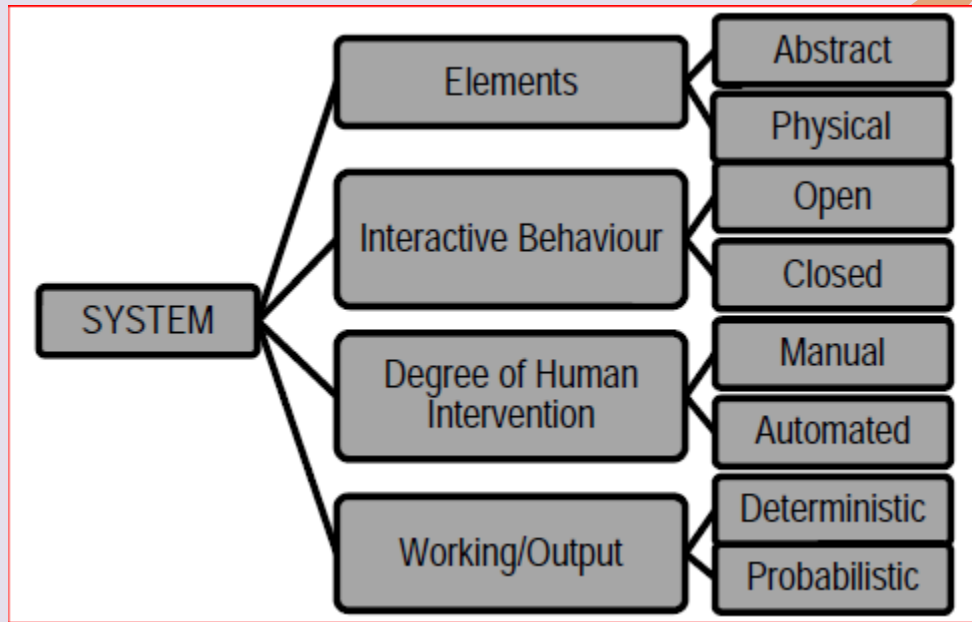


Chapter -2

Information Systems Concepts

System: A system is a group of inter connected components working towards the accomplishment of a common goal by accepting inputs and producing outputs in an ordered transformation process.

Classification of Systems: System can be classified on the basis of various parameters like elements, interactive behavior, degree of human intervention and working output as shown in the following diagram:



1. **On the basis of Elements:**

- A. **Abstract System** also known as **Conceptual System or Model** can be defined as an orderly arrangement of interdependent ideas or constructs. For example, a system of theology is an orderly arrangement of ideas about God and the relationship of humans to God.
- B. **Physical system** is a set of tangible elements, which operated together to accomplish an objective e.g. Computer system, University system etc.

2. **On the basis of Interactive behavior:**

- A. **An Open system** interacts with other systems in its environment.
- B. **Closed system** does not interact with the environment and does not change with changes in environment. For example; Information system is an open system because it takes input from the environment and produces output to the environment, which changes as per the changes in the environment. Consider a 'throw-away type sealed digital watch, which is a system, composed of a number of components that work in a cooperative fashion designed to perform some specific task. This watch is a closed system as it is completely isolated from its environment for its operation.

3. **On the basis of degree of Human intervention:**

- A. In a **Manual System** the data collection, maintenance and final reporting is done by human.
- B. In the case of **automated system** it is carried out by computer system or say machine itself.

4. **On the basis of Working/Output:**

- A. A **Deterministic System** operates in a predictable manner
- B. **Probabilistic System** can be defined in terms of probable behavior.
For example; software that performs on a set of instructions is a deterministic system whereas inventory system is a probabilistic system where the average demand, average time for replenishment, etc. may be defined, but the exact value at any given time is not known.

Information Systems and its Components: With the help of Information Systems, enterprises and individuals are able to use computers to collect, store, process, analyze, and distribute information. An effective information system has following components:

1. People,
2. Computer System – is combination of hardware & software,
3. Data and
4. Network- required for communication support

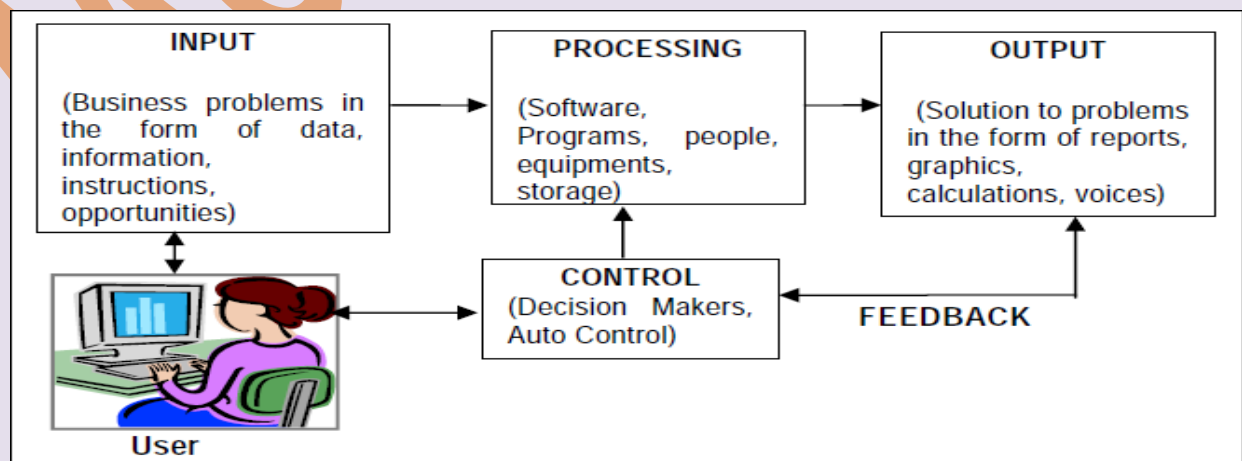
An Information System model comprises of following steps:

- Data is collected from an organization or from external environments and converted into suitable format required for processing (**Input**);
- This is converted into information (more meaningful form) obtained after manipulation of these collected data (**Processing**); and
- Then information is stored for future use or communicated to user after application of respective procedure on it (**Output**).

Some of the important characteristics of Computer Based Information Systems are given as follows:

- All systems work for predetermined objectives and the system is designed and developed accordingly.
- In general, a system has a number of interrelated and interdependent subsystems or components. No subsystem can function in isolation; it depends on other subsystems for its inputs.
- If one subsystem or component of a system fails; in most of the cases, the whole system does not work. However, it depends on 'how the subsystems are interrelated'.
- The way a subsystem works with another subsystem is called interaction. The different subsystems interact with each other to achieve the goal of the system.

Functions of Information Systems: We can better understand to the functions of information systems with the help of following diagram.



Major areas where Computer based information Systems used are :

1. Accounting & finance
2. Sales & Marketing
3. Production or Manufacturing
4. Inventory or store Management
5. Human Resource Management

Types of Information Systems: Conceptually, information systems are categorized as follows:

1. Operations Level Systems
2. Knowledge level Systems
3. Management level Systems

Now, we are explaining above all points in the following paragraphs one by one:

1. **Operations Level Systems:** Operations Level Systems produce a variety of information for internal and external use. Their role is to effectively process business transactions, control industrial processes, support enterprise communications and collaborations and update corporate database. The main objective of OSS is to improve the operational efficiency of the enterprise. These are further categorized as follows:

Transaction Processing Systems (TPS) - At the lowest level of management, TPS is an information system that manipulates data from business transactions. Any business activity such as sales, purchase, production, delivery, payments or receipts involves transaction and these transactions are to be organized and manipulated to generate various information products for external use. For example, selling a product to a customer will give rise to the need of further information customer billing, inventory status and increase in account receivable balance. TPS will thus record and manipulate transaction data into usable information.

TPS Components: The principal components of a TPS include

- I. Inputs,
- II. Processing,
- III. Storage and
- IV. Outputs.

The components or elements are part of both manual and computerized systems.

Features of TPS: Basic features of TPS are:

1. Large volume of data,
2. Automation of basic operations,
3. Benefits are easily measurable,
4. Source of input for other systems.

2. **Knowledge – Level Systems:** These systems support discovery, processing and storage of knowledge and data workers. These support the business to integrate new knowledge into the business and control the flow of paperwork and enable group working.

- A. **Office Automation Systems (OAS)** – It is most rapidly expanding computer based information systems. Different office activities can be broadly grouped into the following types of operations:

1. Document Capture,
2. Document Creation,
3. Receipts and Distribution,
4. Filling,
5. Search,
6. Retrieval and Follow up,
7. Calculations,

8. Recording Utilization of Resources.

Benefits of OAS is:

1. improve communication
2. reduce the cycle time
3. reduce the costs of office communication
4. ensure accuracy of information
5. smooth flow of communication

All the activities mentioned have been made very simple, efficient and effective by the use of computers. Application of computers to handle the office activities is also termed as office automation.

Computer based Office Automation Systems: Major computer based OAS are:

1. Text Processing Systems,
2. Electronic Document Management System,
3. Electronic Message Communication Systems,
4. Teleconferencing and Video-conferencing Systems.

Components of electronic message communication System:

- a. Electronic Mail (Features – Electronic transmission, Online development & editing, integration with other information)
- b. Fax
- c. Voice mail

- B. Knowledge Management Systems** – Knowledge Management (KM) is the process of capturing, developing, sharing, and effectively using organizational knowledge. It refers to a multi-disciplined approach to achieving organizational objectives by making the best use of knowledge. *Knowledge Management Systems (KMS) refers to any kind of IT system that stores and retrieves knowledge, improves collaboration, locates knowledge sources, mines repositories for hidden knowledge, captures and uses knowledge, or in some other way enhances the KM process.* **Explicit** and **Tacit** are two types of knowledge.

1. **Explicit knowledge:** Explicit knowledge is that which can be formalized easily and as a consequence is easily available across the organization. For example – Codified knowledge found in documents & database etc.
2. **Tacit knowledge:** Tacit knowledge, on the other hand, resides in a few often-in just one person and hasn't been captured by the organization or made available to others. For example – hand on skills, special know how & employee experience etc.

- A. Management Level Systems:** It supports the middle managers in monitoring, decision-making and administrative activities. It provides periodic reports rather than instant information on operations. For example- a college control system gives report on the number of leaves availed by the staff, salary paid to the staff, funds generated by the fees, finance planning etc. These are generally categorized into –

1. **Management Information System (MIS)** and
2. **Decision Support Systems (DSS).**

(i) Management Information Systems (MIS) – “MIS is a computer based system that provides flexible and speedy access to accurate data”. MIS support the managers at different levels to take strategic (at top level) or tactical (at middle level) management decisions to fulfill the organizational goals.

Characteristics of an effective MIS: Major characteristic of an effective MIS are:

1. Management Oriented,
2. Management Directed,
3. Integrated,

4. Common Data Flows,
5. Heavy Planning Element,
6. Sub System Concept,
7. Common Database and
8. Computerized.

Pre-requisites of an Effective MIS – The pre-requisites of an effective MIS are:

1. Database,
2. Qualified System and Management Staff,
3. Support of Top Management
4. Control and maintenance of MIS.

(ii) Decision Support System (DSS) – DSS is a type of computerized information system that supports business and organizational decision-making activities. A Decision Support System (DSS) can be defined as a system that provides tools to managers to assist them in solving semi-structured and unstructured problems in their own, somewhat personalized, way. A DSS is not intended to make decisions for managers, but rather to provide managers with a set of capabilities that enable them to generate the information required by them in making decisions. A DSS supports the human decision-making process, rather than a means to replace it. DSS uses planning languages - General-purpose planning languages, Special-purpose planning languages.

Components of DSS – A DSS comprise of basic components, which are:

- i. **The user:** Manager, Staff Specialist (Analysts)
- ii. **Databases:** Database is implemented at three levels: Physical level, Logical Level, External level.
- iii. **Model base:** The planning language in a DSS allows the user to maintain a dialogue with the model base, which is the “brain” of DSS because it performs data manipulations and computations with the data provided to it by the user and the database.

Difference between DSS and Traditional MIS

Dimension	DSS	Traditional MIS
Philosophy	Providing integrated tools, data,	Providing structured information to end users
Orientation	External	Internal orientation
Flexibility	Highly flexible	Relatively inflexible
Analytical	More analytical	Little analytical
System analysis	Emphasis on tools to be	Emphasis on information
System design	Interactive process	System development based on static

TYPES OF SYSTEMS					GROUPS SERVED
ESS	<u>Strategic Level Systems</u> 5-year operating plan 5-year budget forecasting 5-year sales trend forecasting Pro fit planning Manpower planning				Senior Managers
MIS DSS	<u>Management Level Systems</u> Sales management Inventory Control Annual budgeting Capital Investment analysis Relocation analysis Sales region analysis Production Scheduling Cost analysis Pricing/profitability analysis Contract cost analysis				Middle Managers
KMS OAS	<u>Knowledge Level Systems</u> Engineering workstations Word processing Graphics workstations Document Imaging Managerial workstations Electronic Calendars				Knowledge and Data Workers
TPS	<u>Operational Level Systems</u> Order Tracking Machine control Securities trading Payroll Compensation Order processing Plant scheduling Accounts payable Training & development Order processing Material movement control Cash management Accounts receivable Employee record keeping				Operational Managers
	Sales and marketing	Manufacturing	Finance	Accounting	Human Resources

C. **Strategic Level Systems:** It supports the senior level management to tackle and address strategic issues and long term trends, both inside organization and the outside world.

(A) **Executive Information Systems (EIS)** – It is sometimes referred to as an Executive Support System (ESS). It serves the strategic level i.e. top level managers of the organization. ESS creates a generalized computing and communications environment rather than providing any preset applications or specific competence.

Characteristics of EIS – Major Characteristics of an EIS are given as follows:

- EIS is a Computer-based-information system that serves the information need of top executives.
- EIS enables users to extract summary data and model complex, problems without the need to learn query languages statistical formulas or high computing skills.
- EIS provides rapid access to timely information and direct access to management reports.
- EIS is capable of accessing both internal and external data.
- EIS provides extensive online analysis tool like trend analysis, market conditions etc.
- EIS can easily be given as a DSS support for decision making.

The Executive Decision-Making Environment – The type of decisions that executives must make are very broad. Often, executives make these decisions based on a vision they have regarding 'what it will take to make their enterprise successful.'

Some of the **characteristics** of the types of information used in executive decision making are:

1. High degree of uncertainty,

2. Future orientation, Informal Source,
3. Low level of detail.
4. Lack of structure,

Specialized Systems: Apart from the information systems discussed above, there exists other categories of information systems also that support either operations or management applications. Some of them are Expert Systems, Cross Functional Information Systems, and Core Banking System (CBS) etc. These are briefed as follows:

- i. **Expert Systems** - An Expert System is highly developed DSS that utilizes knowledge generally possessed by an expert to solve a problem. Expert Systems are software systems that imitate the reasoning processes of human experts and provide decision makers with the type of advice they would normally receive from such experts. A characteristic of expert systems is the ability to declare or explain the reasoning process that was used to make decisions.

Some of the business applications of the expert systems are as follows:

- a. **Accounting & finance**– It provides tax advice & assistance, selecting and forecasting model.
- b. **Marketing**– sales quotas, responding to customer enquiry, determining discount policies.
- c. **Personnel** – useful in assessing applicant qualification, filling up employee form.
- d. **General Business** – project proposal, educating trainees, & evaluating performance.

Benefits of Expert system have been given below:

- A. Preserve knowledge
- B. Put information into an active form
- C. Effectively used as strategic tool

Still, expert system are not always the answer to managerial or organizational problems. Some of the properties tha potential application should posses to qualify for expert system are as follows:

- Availability
- Complexity
- Domain
- Expertise
- structure

- ii. **Cross Functional Information Systems** – It is also known as integrated information system that combines most of information systems and designed to produce information and support decision making for different levels of management and business functions. Example – Enterprise Resource Planning (ERP).

Enterprise Resource Planning (ERP) - Enterprise resource planning (ERP) is process management software that allows an organization to use a system of integrated applications to manage the business and automate many back office functions related to technology, services and human resources. ERP software integrates all facets of an operation, including product planning, development, manufacturing, sales and marketing.

Components of ERP: It has four components which have been mentioned below :

- ✓ **Software component** – most visible part and consist of several modules eg. Human Resource, Finance & Marketing etc.
- ✓ **Process flow** : model that illustrate that how information flow among the different module within an ERP system
- ✓ **Customer mindset**
- ✓ **Change management** : changes need to be managed at several level like –user attitude.

Benefits of ERP- There are so many benefits of ERP. Some of them is:

- 1) Shares information across the department
- 2) Improve workflow & efficiency
- 3) Establish uniform process

- 4) Improve customer satisfaction
- 5) Reduce inventory cost
- 6) Turn collection faster
- 7) Track actual cost of activity
- 8) Provide consolidated picture (Sales, inventory & receivables)

- iii. **Core Banking System** - Core Banking System (CBS) may be defined as a back-end system that processes daily banking transactions, and posts updates to accounts and other financial records. These systems typically include deposit, loan and credit-processing capabilities, with interfaces to general ledger systems and reporting tools. Core banking functions differ depending on the specific type of bank. Examples of core banking products include Infosys' Finacle, Nucleus FinnOne and Oracle's Flexcube application (from their acquisition of Indian IT vendor i-flex).

Element of core banking system is:

1. Making & Servicing loan
2. Opening new accounts
3. Processing cash receipts & withdrawals
4. Processing payments & cheques
5. Calculating interest
6. Managing customer accounts
7. Establishing interest rate
8. Maintaining transactions of all bank's transactions.

Application of Information Systems in Enterprise Processes: Information systems perform following three vital roles in business firms:

- I. **Support an organization's business processes and operations:** This includes operations support systems such as Transaction Processing Systems, Process Control Systems.
- II. **"Support business decision-making":** This includes Management Information Systems, Decision Support Systems, and Executive Information Systems.
- III. **Support strategic competitive advantage:** This includes Expert Systems, Knowledge Management Systems, Strategic Information Systems, and Functional Business Systems.

To operate Information Systems (IS) effectively and efficiently, a business manager should have knowledge about:

1. Foundation Concept
2. Information Technologies (IT),
3. Business Applications,
4. Development Processes, and
5. Management Challenges.

The primary areas where IT enabled tools are used in any organization is shown in Fig. 2.2.6 whereas Fig. 2.2.7 showcases different IT enabled tools used at three layers i.e. top, middle and lower management of an organization.

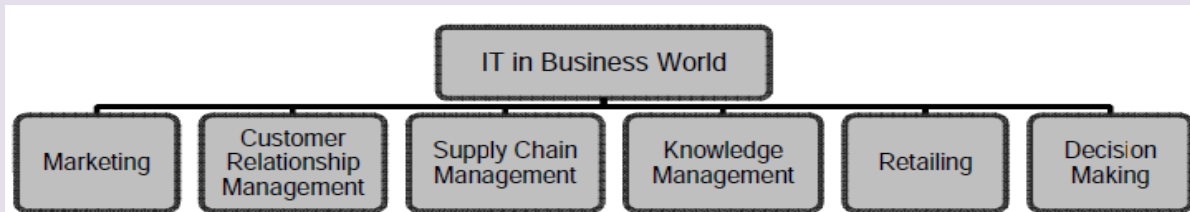


Fig. 2.2.6: IT in Prime Business Areas

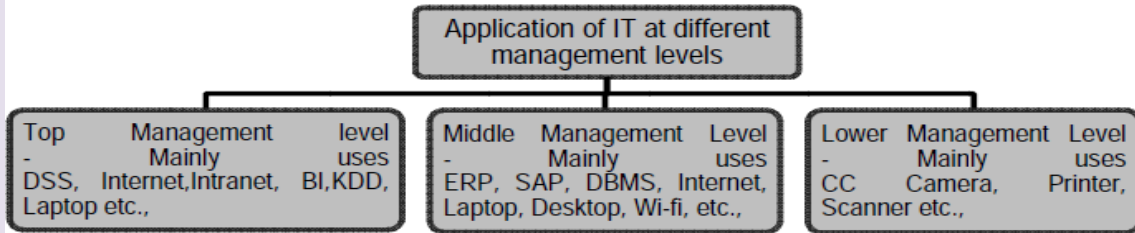


Fig. 2.2.7: Application of IT at Different Management Levels

Information: Technically, Information means processed data. Data consists of facts, values or results, and information is the result of relations between data e.g. in a spread sheet, student name, roll number and marks obtained in science and arts subjects represent data, whereas the graph that shows the percentage of students, who acquired more than 80% in science subjects and 65% in arts subjects represents information. Information may be represented in the form of text, graph, pictures, voice, videos etc.

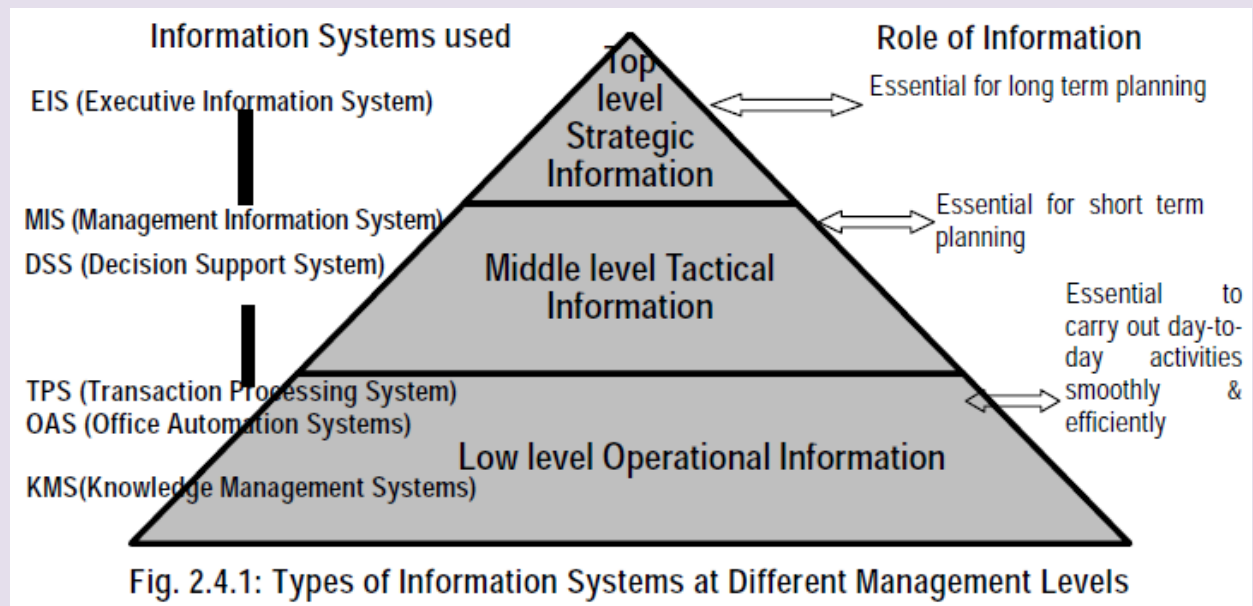
Information is data that have been put into a meaningful and useful context. Mere collection of data is not information and mere collection of information is not knowledge.

Attributes of Information: These are –

1. Availability,
2. Purpose,
3. Mode and Format,
4. Decay-Rate,
5. Frequency,
6. Completeness,
7. Reliability,
8. Cost-benefit Analysis,
9. Validity, Quality,
10. Transparency, and
11. Value of Information.

Role of Information in Business: The information can be categorized on the basis of its requirement by the top, middle and lower level management we can better understand by the following diagram.

1. The top management generally comprise of owners/shareholders, board of directors, its chairman, managing director, or the chief executive, or the managers committee having key officers,
- 2.
3. The middle management comprise of heads of functions departments e.g. purchase manager, production manager, marketing managers, financial controller, and divisional sectional officers working under these functional heads,
4. The lower level managers are superintendents, supervisor, etc.



Relative Importance of Information Systems from Strategic and Operational Perspectives:

In this age of technology and competition, enterprises are looking for novel ideas and information that can enhance and expand their business. In order to achieve this, they are becoming more and more dependent on information systems. Information system is used in every aspects of business right from customer relationship management, marketing strategies, retailing, communication, product promotion, product development, forecast future sales to supply chain management etc. ERP, Data Mining tools, Data warehouse, Business intelligence, MIS, internet, intranet, extranet etc. are the information systems and information technologies that support managers in every step of business.

Overview of Underlying IT Technologies: Major IT tools crucial for business growth are:

1. Business Website,
2. Internet and Intranet, Software Packages,
3. Computer Systems,
4. Scanners, Laptop,
5. Printer,
6. Webcam,
7. Smart Phone etc.