

Information Systems Concepts

- To explain the basic concepts of Systems and their types;
- To understand the concepts of Information Systems;
- To explain various types of Information systems and their applications;
- To understand Information and its applications in businesses and organizations; and
- To explain the role of Information Technology (IT) in organizations and businesses.

Task Statements

- To distinguish among different types of systems e.g. open, closed, probabilistic, deterministic, manual, physical etc.;
- To differentiate between data and information;
- To distinguish among different information systems e.g. TPS, MIS, DSS, EIS and office automation systems etc.;
- To select the appropriate information system for a given problem; and
- To understand various terms e.g. database, data mining, data warehouse, ERP and business intelligence.

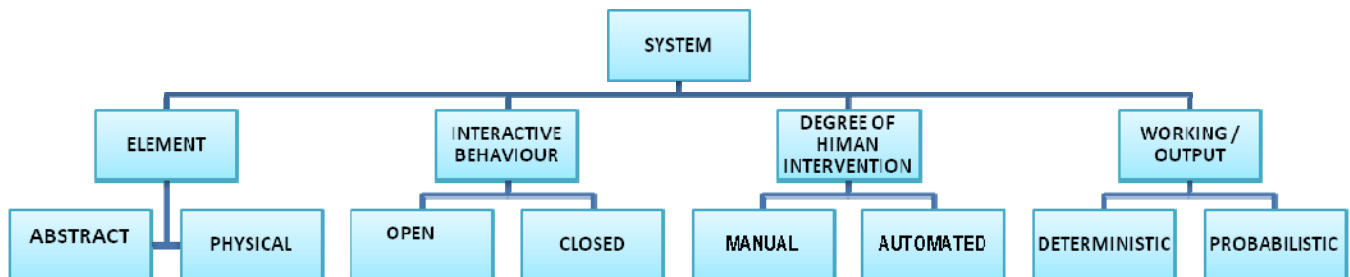
Knowledge Statements

- To know the concepts of computer based information systems;
- To know the features, components and applications of different types of information systems e.g. TPS, MIS, DSS, OAS etc.;
- To know the types of information needed in top, middle and lower management levels of an organization;
- To know the role of information in different management levels of an organization;
- To know the attributes of information;
- To know the role of IT in various types of business applications e.g. E-business, wholesale marketing, retailing, public sectors etc.; and
- To know the underlying technologies for a computer based information system.

2.2.1 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. A system generally consists of **input, processing, storage and output**.

2.2.2 Classification of System

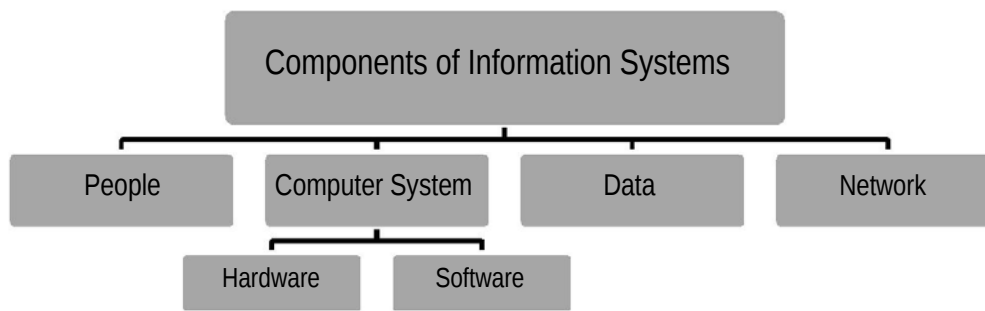


(i) **On the basis of Elements:** Abstract System Also known as **Conceptual System or Model** can be defined as an orderly arrangement of **interdependent ideas** or constructs. For example, a system of theology is an orderly arrangement of ideas about God and the relationship of humans to God. On the other hand, **Physical system** is a set of tangible elements, which operated together to accomplish an objective e.g. Computer system, University system etc.

(ii) **On the basis of Interactive behavior:** Systems may be classified as Open systems or closed system based on 'how the system interacts with environment'. An **Open system** interacts with other systems in its environment whereas a **closed system** does not interact with the environment and does not change with the 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.

(iii) **On the basis of degree of human intervention:** In a **manual system** the data collection, maintenance and final reporting is done by human whereas it is carried out by computer system or say machine itself in the case of **automated system**.

(iv) **On the basis of working/output:** A **deterministic system** operates in a predictable manner whereas **probabilistic system** can be defined in terms of probable behaviour. 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.



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).

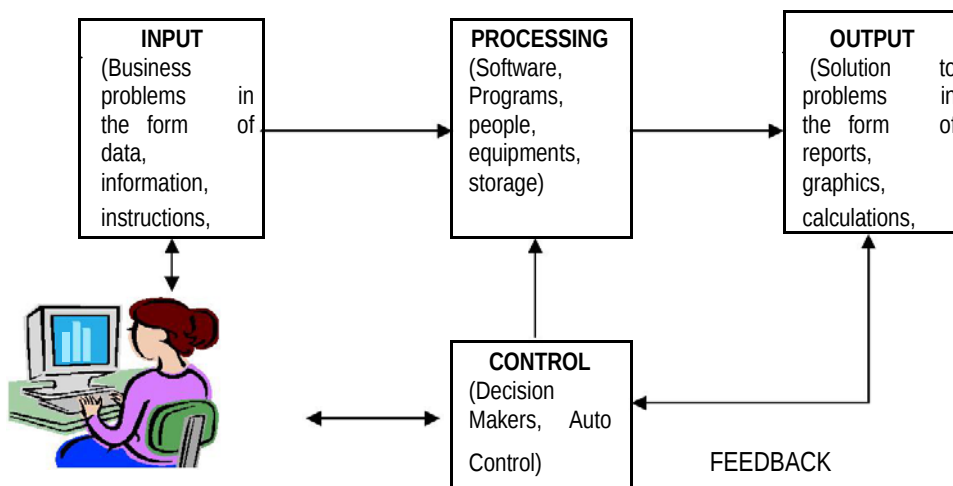
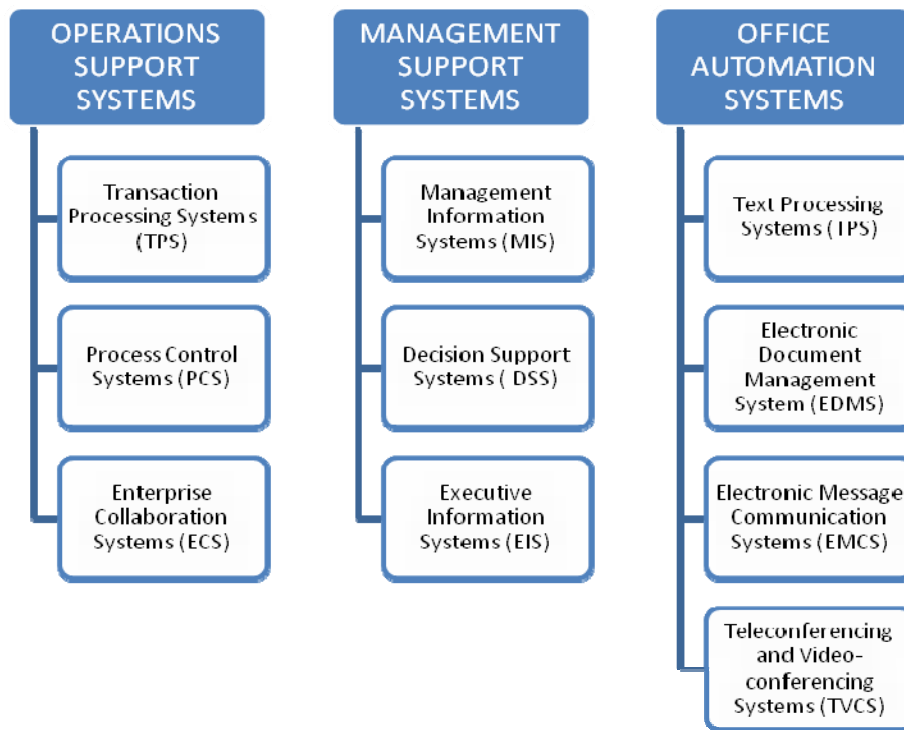


Fig. 2.2.3: Functions of Information Systems

2.2.4 Types of Information Systems



I) OPERATIONS SUPPORT SYSTEMS (OSS): Its 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:

(A) Transaction Processing Systems (TPS)- At the lowest level of management, TPS will thus record and manipulate transaction data into usable information 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. A TPS involves the following activities:

- **Capturing data** to organize in files or databases;
- **Processing of files/databases** using application software;
- **Generating** information in the form of **reports**; and
- **Processing of queries** from various quarters of the organization.

A TPS may follow the periodic data preparation and batch processing (as in payroll application) or on-line processing (as in inventory control application)

(a) TPS Components: The principal components of a TPS include inputs, processing, storage and outputs.

- **Inputs** – Source documents, such as customer orders, sales, slips, invoices, purchase orders, and employee time cards, are the physical evidence of inputs in to the Transaction Processing System.
- **Processing** – This involves the use of journals and registers to provide a permanent and chronological record of inputs. Journals are used to record financial accounting transactions, and registers are used to record other types of data not directly related to accounting. Some of the common journals are sales journal, purchase journal, cash receipts journal etc.
- **Storage** – Ledgers and files provide storage of data on both manual and computerized systems. The general ledger, the accounts/vouchers payable ledgers, and the accounts receivable ledger are the records of final account that provide summaries of a firm's financial accounting transactions.
- **Outputs** – Any document generated in the system is output. Some documents are both output and input. For example; a customer invoice is an output from the order-entry application system and also an input document to the customer. The trial balance lists the balances of all the accounts on the gametal ledger and tests the accuracy of the record keeping. Financial reports summarize the results of transaction processing and express these results in accordance with the principles of financial reporting.

(b) Features of TPS (Love At Both Side)

Basic features of TPS are given as follows:

- **Large volume of data-** As TPS is transaction oriented and generally consists of large volumes of data, it requires greater storage capacity. Their primary objective is to ensure that the data regarding the economic events in the enterprises are captured quickly and correctly.

- **Automation of basic operations-** Any TPS aims at automating the basic operations of a business enterprise and plays a critical role in the day-to-day functioning of the enterprise. Any failure in the TPS for a short period of time can play havoc with the functioning of the enterprise. Thus, TPS is an important source of up-to-date information regarding the operations in the enterprise.
 - **Benefits are easily measurable-** TPS reduces the workload of the people associated with the operations and improves their efficiency by automating some of the operations. Most of these benefits of the TPS are tangible and easily measurable
 - **Source of input for other systems-** TPS is the basic source of internal information for other information systems. Heavy reliance by other information systems on TPS for this purpose makes TPS important for tactical and strategic decisions as well.
- (B) **Process Control System (PCS)** – In this type of system, computer is used to control ongoing physical processes. The computers are designed to automatically make decisions, which adjust the physical production process. For example- the assembly lines of the automated factories.
- (C) **Enterprise Collaboration Systems (ECS)** – These systems use a variety of technologies to help people work together. It supports collaboration to communicate ideas, share resources and co-ordinate cooperative work efforts. Its objective is to use IT to enhance the productivity and creativity of teams in enterprises.

(II) MANAGEMENT SUPPORT SYSTEMS (MSS): MSS supports managers in effective decision making by providing relevant and required information at the right time to the right people.

(A) **MANAGEMENT INFORMATION SYSTEMS (MIS):** MIS enables management at different levels in decision making and problem solving in contrast to TPS, which is operations oriented. They use results produced by the TPS, but they may also use other information.

MIS is an integrated user-machine system designed for providing information to support operational control, management control and decision making functions in an organization". Other notable definition of MIS is "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. Nature of MIS at different levels has different flavors and they are available in the form of reports, tables, graphs and charts or in presentation format using some tools.

(a) **Characteristics of an effective MIS – One Day International Cricket He – Sab Chennai Chalo**

- **Management Oriented** – It means that efforts for the development of the information system should start from an appraisal of management needs and overall business objectives. Such a system is not necessarily for top management only but may also meet the information requirements of middle level or operating levels of management as well.
- **Management Directed** – Because of management orientation of MIS, it is necessary that management should actively direct the system's development efforts. For system's effectiveness, it is necessary for management to devote their sufficient time not only at the stage of designing the system but for its review as well to ensure that the implemented system meets the specifications of the designed system.
- **Integrated** – All the functional and operational information sub-systems are be tied together into one entity. An integrated Information system has the capability of generating more meaningful information to management.
- **Common Data Flows** – It means the use of common input, processing and output procedures and media whenever required. Data is captured by the system analysts only once and as close to its original source as possible.
- **Heavy Planning Element** – An MIS usually takes one to three years and sometimes even longer period to get established firmly within a company. Therefore, a MIS designer must be present in MIS development and should consider future enterprise objectives and requirements of information as per the organization structure of the enterprise as per requirements.
- **Sub System Concept** – Even though the information system is viewed as a single entity, it must be broken down into digestible sub-systems, which can be implemented one at a time by developing a phased plan. The breaking down of MIS into meaningful sub-systems sets the stage for this phasing plan.
- **Common Database** – The organization of a database allows it to be accessed by several information sub-systems and thus, eliminates the necessity of duplication in data storage, updating, deletion and protection.
- **Computerized** – Though MIS can be implemented without using a computer; the use of computers increases the effectiveness of the system..

(b) **Misconceptions about MIS** – Following are the major misconceptions about MIS:

- Any computer based information system is a MIS.
- Any reporting system is MIS.
- MIS is a management technique.
- MIS is a bunch of technologies.
- MIS is an implementation of organizational systems and procedures. It is a file structure.
- The study of MIS is about use of computers.
- More data in generated reports refers more information to managers.
- Accuracy plays vital role in reporting.

(c) Pre-requisites of an Effective MIS –

1. **Database** - The main characteristics of database are given as follows:
 - It is user-oriented.
 - It is capable of being used as a common data source to various users, helps in avoiding duplication of efforts in storage and retrieval of data and information.
 - It is available to authorized persons only.
 - It is controlled by a separate authority established for the purpose, known as Database Management System (DBMS).
2. **Qualified System and Management Staff.** For this, the organizational management base should comprise of two categories of officers; Systems and Computer experts and Management experts.
 - ❖ Systems and Computer experts in addition to their expertise in their subject area/s should also be capable of understanding management concepts to facilitate the understanding of problems faced by the concern. They should also be clear about the process of decision making and information requirements for planning and control functions.
 - ❖ Management experts should also understand quite clearly the concepts and operations of a computer. This basic knowledge of computers will be useful to place them in a comfortable position, while working with systems technicians in designing or otherwise of the information system.
3. **Support of Top Management** – The support from top management is required for the effectiveness of MIS in The reasons for the same are as follows:
 - ❖ Any implementation, which does not receive the support of top management will not be effectively controlled and tends to be get lesser priority and may be delayed or abandoned.
 - ❖ The resources involved in computer-based information systems are large and are growing larger in view of importance gained by management information system.
 - ❖ To gain the support of top management, the officers should place before top management all the supporting facts and state clearly the benefits, which will accrue from it to the concern. This step will certainly enlighten management, and will change their attitude towards MIS. Their wholehearted support and cooperation will help in making MIS an effective one.
4. **Control and maintenance of MIS-** Control of the MIS means the operation of the system as it was designed to operate. Some time, users develop their own procedures or short cut methods to use the system, which reduce its effectiveness. To check such habits of users, the management at each level in the organization should devise checks for the information system control.

(d) Evaluation of MIS – The evaluation of MIS should take into account the following major points:

- Examining whether enough flexibility exists in the system to cope with any expected or unexpected information requirement in future.
- Ascertaining the views of users and the designers about the capabilities and deficiencies of the system.
- Guiding the appropriate authority about the steps to be taken to maintain effectiveness of MIS.

(e) Constraints in operating a MIS – Major constraints, which come in the way of operating an information system, are given as follows:

- Non-availability of experts, who can diagnose the objectives of the organization and provide a desired direction for installing operating system. This problem may be overcome by grooming internal staff, which should be preceded by proper selection and training.
- Experts usually face the problem of selecting the sub-system of MIS to be installed and operated upon. The criteria, which should guide the experts, depend upon the need and importance of a function for which MIS can be installed first.
- Due to varied objectives of business concerns, the approach adopted by experts for designing and implementing MIS is a non-standardized one.
- Non-availability of cooperation from staff is a crucial problem, which should be handled tactfully. This task should be carried out by organizing lectures, showing films and also explaining to them the utility of the system. Besides this, some persons should also be involved in the development and implementation of the system.

(f) Limitations of MIS – Major Limitations of MIS are given as follows:

- The quality of the outputs of MIS is basically governed by the quantity of input and processes.
- MIS is not a substitute for effective management, which means that it cannot replace managerial judgment in making decisions in different functional areas. It is merely an important tool in the hands of executives for decision making and problem solving.
- MIS may not have requisite flexibility to quickly update itself with the changing needs of time, especially in fast changing

and complex environment.

- MIS cannot provide taylor-made information packages suitable for the purpose of every type of decision made by executives.
- MIS takes into account mainly quantitative factors, thus it ignores the non-quantitative factors like morale and attitude of members of organization, which have an important bearing on the decision making process of executives or senior management.
- MIS is less useful for making non-programmed decisions. Such types of decisions are not of the routine type and thus require information, which may not be available from existing MIS to executives.
- The effectiveness of MIS is reduced in enterprises, where the culture of hoarding information and not sharing with other holds.
- MIS effectiveness decreases due to frequent changes in top management, organizational structure and operational team.

(B) **DECISION SUPPORT SYSTEM (DSS)** - DSS is a type of computerized information system that supports business and organizational decision-making activities. A properly-designed DSS is an interactive software-based system intended to help decision makers to compile useful information from raw data, documents, personal knowledge, and/or business models to identify and solve problems and make decisions. In other words, 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.

(a) **Characteristics of DSS** – The key characteristics of DSS are given as follows:

- This supports decision making and occurs at all levels of management.
- Instead of helping individuals working on independent tasks, it should be able to help group making decisions.
- It should be flexible and adaptable. i.e. it should be able to fit itself in the style of a particular manager and ready to change according to changes in the environment.
- DSS focuses on decision rather than data and information.
- It should be easy to use. A user should not have knowledge of computer programming to generate reports that helps in decision making.
- DSS can be used for structured problems.
- DSS should be user-friendly.
- DSS should be extensible and evolve overtime.
- DSSs are used mainly for decision making rather than communicating decisions and training purposes.
- The impact of DSS should be on decision where the manager's judgment is essential and there is sufficient structure for computers.

(b) **Components of DSS** – A decision support system comprise of four basic components, which are discussed below:

1. **The user-** The user of a DSS is usually a manager with an unstructured or semi-structured problem to solve.
 - ❖ **Manager-** These are the users, who have basic computer knowledge and want the DSS to be very user friendly. The manager may be at any level of authority in the organization (e.g., either top management or operating management).
 - ❖ **Staff Specialist (Analysts) -** These are the people, who are more details oriented and willing to use complex system in their day-to-day work.
2. **Databases** – A DSS includes one or more databases that contain both routine and non-routine data from both internal and external sources. External data include assumptions about such variables as interest rates, vacancy rates, market prices, and levels of competition.
 - **Implementation of Database-** Database is implemented at three levels as listed below:
 - ✓ **Physical level** – It involves the implementation of the database on the hard disk i.e. storage of data in the hard disk. The management of storage and access is controlled by operating system.
 - ✓ **Logical Level** – It is designed by **professional programs, who have complete knowledge of DBMS**. It deals with the nature of data stored, the scheme of the data. Storage which is logically divided into various tables having rows and columns and the techniques for defining relationships with indexes.
 - ✓ **External level** – The logical level defines schema, which is divided into smaller units known as sub-schemas and given to the managers each sub-schema containing all relevant data needed by one manager.

3. **Planning languages** – Two types of planning languages that are commonly used in DSS are: General-purpose planning languages and Special-purpose planning languages. These are discussed below:

- **General-purpose planning languages** that allow users to perform many routine tasks, for example; retrieving various data from a database or performing statistical analyses. The languages in most electronic spreadsheets are good examples of general-purpose planning languages. These languages enable user to tackle abroad range of budgeting, forecasting, and other worksheet-oriented problems.
- **Special-purpose planning languages** are more limited in what they can do, but they usually do certain jobs better than the general-purpose planning languages. Some statistical languages, such as SAS and SPSS, are examples of special purpose planning languages.

4. **Model base** –Model base is the “brain” of DSS because it performs data manipulations and computations with the data provided to it by the user and the database.

(c) **Examples of Decision Support Systems in Accounting** – Many DSS are developed in-house using either a general type of decision support program or a spreadsheet program to solve specific problems. Below are several illustrations of these systems:

- **Cost Accounting System-**
- **Capital Budgeting System-**
- **Budget Variance Analysis System-**
- **General Decision Support System-**

(d) **Difference between DSS and traditional MIS:**

Dimensions	DSS	Traditional MIS
Philosophy	Providing integrated tools, data, models, and languages to end users	Providing structured information to end users
Orientation	External orientation	Internal orientation
Flexibility	Highly flexible	Relatively inflexible
Analytical capability	More analytical capability	Little analytical capability
System analysis	Emphasis on tools to be used in decision process	Emphasis on information requirement analysis
System design	Interactive process	System development based on static information requirements

(C) **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.

(a) **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**.

(b) **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.’ To a large extent, executives rely much more on their own intuition than on the sophisticated analytical skills. The intuitive character of executive decision-making is reflected strongly in the types of information found most useful to executives. **Five characteristics of the types of information used in executive decision making are given as follows: (I Love HFL)**

- **Lack of structure** – Many of the decisions made by executives are relatively unstructured. Also, it is not always obvious, ‘which data are required’ or ‘how to weigh available data when reaching a decision.’
- **High degree of uncertainty** – Executives work in a decision space that is often characterized by a lack of precedent. For example, when the Arab oil embargo hit in mid 1970s, no such previous event could be referenced for advice. Executives also work in a decision space where results are not scientifically predictable from actions. If prices are lowered, for instance, product demand will not automatically increase.
- **Future orientation** – Strategic-planning decisions are made in order to shape future events. As conditions change, enterprises must change also. It is the executive’s responsibility to make sure that the organization keeps pointed toward

the future.

- **Informal Source** – Executives, more than other types of managers, rely heavily on informal source for key information. For example, lunch with a colleague in another firm might reveal some important competitor strategies. Informal sources such as television might also feature news of momentous concern to the executive – news that he or she would probably never encounter in the company's database or in scheduled computer reports.
- **Low level of detail** – Most important executive decisions are made by observing broad trends. This requires the executive to be more aware of the large overview than the tiny items. Even so, many executives insist that the answers to some questions can only be found by mucking through details.

Contents of EIS –

A practical set of principles to guide the design of measures and indicators to be included in an EIS is presented below:

- EIS measures must be easy to understand and collect. Wherever possible, data should be collected naturally as part of the process of work. An EIS should not add substantially to the workload of managers or staff.
- EIS measures must be based on a balanced view of the organization's objective. Data in the system should reflect the objectives of the organization in the areas of productivity, resource management, quality and customer service.
- Performance indicators in an EIS must reflect everyone's contribution in a fair and consistent manner. Indicators should be as independent as possible from variables outside the control of managers.
- EIS measures must encourage management and staff to share ownership of the organization's objectives. Performance indicators must promote both team-work and friendly competition. Measures will be meaningful for all staff; people must feel that they, as individuals, can contribute to improving the performance of the organization.
- EIS information must be available to everyone in the organization. The objective is to provide everyone with useful information about the organization's performance. Information that must remain confidential should not be part of the EIS or the management system of the organization.
- EIS measures must evolve to meet the changing needs of the organization.

(d) Difference between EIS and Traditional Information Systems –

Dimensions of Difference	Executive Information System	Traditional Information System
Level of management	For top or near top executives	For lower staff
Nature of Information Access	Specific Issue/ Problems and aggregate Reports	Status reporting
Nature of Information provided	Online tools and Analysis	Offline Status reporting
Information Source	More External , Less Internal	Internal
Drill down facility to go through details at successive levels	Available	Not available
Information format	Text with graphics	Tabular
Nature of interface	User-friendly	Computer-operator generated

(III) OFFICE AUTOMATION SYSTEMS (OAS) –Different office activities can be broadly grouped into the following types of operations:

- **Document Capture** – Documents originating from outside sources like incoming mails, notes, handouts, charts, graphs etc. need to be preserved.
- **Document Creation** – This consists of preparation of documents, dictation, editing of texts etc. and takes up major part of the secretary's time.
- **Receipts and Distribution** – This basically includes distribution of correspondence to designated recipients.
- **Filling, Search, Retrieval and Follow up** – This is related to filling, indexing, searching of documents, which takes up significant time.
- **Calculations** – These include the usual calculator functions like routine arithmetic, operations for bill passing, interest calculations, working out the percentages and the like.
- **Recording Utilization of Resources** – This includes, where necessary, record keeping in respect to specific resources utilized by office personnel.

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

(a) Benefits of Office Automation Systems –

- Office Automation Systems improve communication within an organization and between enterprises.
- They reduce the cycle time between preparation of messages and receipt of messages at the recipients' end.
- They reduce the costs of office communication both in terms of time spent by executives and cost of communication links.
- Office Automation Systems ensure accuracy of information and smooth flow of communication.

(b) **Computer based Office Automation Systems** – Major computer based OAS are given as follows:

- **Text Processing Systems** –

- A large proportion of the office communication takes place in writing using words of a natural language.
- Text processing systems automate the process of development of documents such as letters, reports, memos etc. They permit use of standard stored information to produce personalized documents. Such automation reduces keying effort and minimizes the chances of errors in the document.
- The text processor may be simple word processing systems or desktop publishing systems. The desktop publishing systems help in quick production of multiple copies of the document with quality printing.
- The desktop publishing systems are often supported with laser printers, inkjet printers, scanners and other such devices for producing good quality documents.

- **Electronic Document Management System** –

- The computer based document management systems capture the information contained in documents, stored for future reference and make them available to the users as and when required.
- These systems are very useful in remote access of documents that is almost impossible with manual document management systems.
- In the case of internal communication, document management systems can prove to be very useful. For example, the loan application form filed in a branch of a bank can be accessed by the sanctioning officer for scrutiny at the head office or any office for scrutiny of loan proposals.
- With computer based document management systems, location of the executive becomes irrelevant for access to documents. Thus, these systems can be very useful in an office environment where traveling executives share work space in the office.

- **Electronic Message Communication Systems** –. The computer based message communication systems offer a lot of economy not only in terms of reduced time in sending or receiving the message but also in terms of reliability of the message and cost of communication.

Components of Message Communication Systems – Three basic components based message communication systems are given as follows:

(a) **Electronic Mail**-

- **Electronic Transmission**- The transmission of messages with email is electronic and message delivery is very quick, almost instantaneous. The confirmation of transmission is also quick and the reliability is very high.
- **Online Development and Editing**- The email message can be developed and edited online before transmission. The online development and editing eliminates the need for use of paper in communication. It also facilitates the storage of messages on magnetic media, thereby reducing the space required to store the messages.
- **Broadcasting and Rerouting**- Email permits sending a message to a large number of target recipients. Thus, it is easy to send a circular to all branches of a bank using Email resulting in a lot of saving of paper.
- **Integration with other Information Systems**- The E-mail has the advantage of being integrated with the other information systems. Such integration helps in ensuring that the message is accurate and the information required for the message is accessed quickly.
- **Portability** - Email renders the physical location of the recipient and sender irrelevant. The email can be accessed from any Personal computer/tablet/smart phones equipped with the relevant communication hardware, software and link facilities.
- **Economical** – The advancements in communication technologies and competition among the communication service providers have made Email the most economical mode for sending and receiving messages.

- (b) **Facsimile (Fax)** – It is electronic communication of images of documents over telephone lines. The computer based fax technology automates fax communication and permits sharing of fax facilities. It uses special software and fax servers to send and receive fax messages using common communication resources. These servers have the ability to receive fax messages and automatically reroute them to the intended recipient after viewing it at the central computer.

- (c) **Voice Mail** – Voice mail is a variation of the email in which messages are transmitted as digitized voice. The recipient of the voice mail has to dial a voice mail service or access the e-mail box using the specified equipment and he can hear the spoken message in the voice of the sender.

- **Teleconferencing and Video-conferencing Systems**- Teleconferencing is conducted in a business meeting involving more than two persons located at two or more different places. The teleconferencing helps in reducing the time and cost. Teleconferencing may be audio or video conferencing with or without use of computer systems. The computer based teleconferencing has the advantage of flexibility in terms of pre-recorded presentations and integration with other information systems.

(iv) **OTHER INFORMATION SYSTEMS**:

- (A) **Expert Systems**- An Expert System is highly developed DSS that utilizes knowledge generally possessed by an expert to share 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 expert systems

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 Expert Systems are:

- **Accounting and Finance-** It provides tax advice and assistance, helping with credit- authorization decisions, selecting forecasting models, providing investment advice.
- **Marketing-** It provides establishing sales quotas, responding to customer inquiries, referring problems to telemarketing centers, assisting with marketing timing decisions, determining discount policies.
- **Manufacturing-** It helps in determining whether a process is running correctly, analyzing quality and providing corrective measures, maintaining facilities, scheduling job-shop tasks, selecting transportation routes, assisting with product design and faculty layouts.
- **Personnel-** It is useful in assessing applicant qualifications, giving employees assistance at filling out forms.
- **General Business-** It helps in assisting with project proposals, recommending acquisition strategies, educating trainees, evaluating performance.

(a) **Need for Expert Systems** – Major reasons for the need of expert systems is given as follows:

- Expert labor is expensive and scarce. Knowledge workers employee, who routinely work with data and information to carry out their day-to-day duties are not easy to find and keep and companies are often faced with a shortage of talent in key positions.
- Moreover, no matter how bright or knowledgeable certain people are, they often can handle only a few factors at a time.
- Both these limitations imposed by human information processing capability and the rushed pace at which business is conducted today put a practical limit on the quality of human decision making this putting a need for expert systems.

(b) **Benefits of Expert Systems** –

- Expert Systems preserve knowledge that might be lost through retirement, resignation or death of an acknowledged company expert.
- Expert Systems put information into an active-form so it can be summoned almost as a real-life expert might be summoned.
- Expert Systems assist novices in thinking the way experienced professional do.
- Expert Systems are not subjected to such human fallings as fatigue, being too busy, or being emotional.
- Expert Systems can be effectively used as a strategic tool in the areas of marketing products, cutting costs and improving products.

Some of the properties that potential applications should possess to qualify for Expert System development are given as follows: - **(ABCDE)**

- **Availability** – One or more experts are capable of communicating 'how they go about solving the problems to which the Expert System will be applied.'
- **Complexity** – Solution of the problems for which the Expert Systems will be used is a complex task that requires logical inference processing, which would not be easily handled by conventional information processing.
- **Domain** – The domain, or subject area, of the problem is relatively small and limited to a relatively well-defined problem area.
- **Expertise** – Solutions to the problem require the efforts of experts. That is, only a few possess the knowledge, techniques, and intuition needed.
- **Built Structure** – The solution process must be able to cope with ill-structured, uncertain, missing, and conflicting data, and a dynamic problem-solving situation.

2.2.5 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 following knowledge about it:

- **Foundation Concepts** – It includes fundamental business, and managerial concepts e.g. 'what are components of a system and

their functions', or 'what competitive strategies are required'.

- **Information Technologies (IT)** – It includes operation, development and management of hardware, software, data management, networks, and other technologies.
- **Business Applications** – It includes major uses of IT in business steps i.e. processes, operations, decision making, and strategic/competitive advantage.
- **Development Processes** – It comprise how end users and IS specialists develop and execute business/IT solutions to problems.
- **Management Challenges** – It includes 'how the function and IT resources are maintained' and utilized to attain top performance and build the business strategies.

FOLLOWING ARE SOME OF THE IMPORTANT IMPLICATIONS OF INFORMATION SYSTEMS IN BUSINESS:

- Information system helps managers in efficient decision-making to achieve the organizational goals.
- An organization will be able to survive and thrive in a highly competitive environment on the strength of a well-designed Information system.
- Information systems helps in making right decision at the right time i.e. just on time.
- A good information system may help in generating innovative ideas for solving critical problems.
- Knowledge gathered through Information system may be utilized in unusual situations.
- Information system is viewed as a process; it can be integrated to formulate a strategy of action or operation.

2.3.1 INFORMATION

Technically, information means **processed data**.

The collection of data is not information and collection of information is not knowledge. Information relates to description, definition, or perspective (what, who, when, where). Information is essential because it adds knowledge, helps in decision making, analyzing the future and taking action in time.

➤ **Attributes of Information:**

- **Availability-** Information is useless if it is not available at the time of need. Database is a collection of files which is collection of records and data from where the required information is derived for useful purpose.
- **Purpose/Objective-** The basic objective of information is to inform, evaluate, persuade, and organize. This indeed helps in decision making, generating new concepts and ideas, identify and solve problems, planning, and controlling which are needed to direct human activity in business enterprises. If there is no purpose than that will be simple information only.
- **Mode and format-** The modes of communicating information to humans should be in such a way that it can be easily understand by the people. The mode may be in the form of voice, text and combination of these two. Format of information should be simple, relevant and should highlight important points but should not be too cluttered up.
- **Current/Updated-** The information should be refreshed from time to time as it usually rots with time and usage
- **Rate-** Useful information is the one which is transmitted at a rate which matches with the rate at which the recipient wants to receive. For example- the information available from internet site should be available at a click of mouse, one should wait for it an hour.
- **Frequency-** The frequency with which information is transmitted or received affects its value. For example- the weekly reports of sales shows little change as compared to the quarterly and contribute less for accessing salesman capability.
- **Completeness and Adequacy-** The information provided should be complete and adequate in itself because only complete information can be used in policy making. For example-the position of student in a class can be find out only after having the information of the marks of all students and the total number of students in a class.
- **Reliability-** It is a measure of failure or success of using information for decision-making. If information leads to correct decision on many occasions, we say the information is reliable.
- **Validity-** It measures how close the information is to the purpose for which it asserts to serve. For example, the experience of employee supports in evaluating his performance.
- **Quality-** It means the correctness of information. For example, an over-optimistic manager may give too high estimates of the profit of product which may create problem in inventory and marketing.
- **Transparency-** It is essential in decision and policy making. For example, total amount of advance does not give true picture of utilization of fund for decision about future course of action; rather deposit-advance ratio is perhaps more transparent information in this matter.
- **Value of information-** It is defined as difference between the value of the change in decision behavior caused by the information and the cost of the information. In other words, given a set of possible decisions, a decision-maker may select one on basis of the information at hand. If new information causes a different decision to be made, the value of the new information is the difference in value between the outcome of the old decision and that of the new decision, less the cost of

obtaining the information.

2.3.2 Role of Information in Business

Timeliness, accurate, meaningful and action oriented information enhances an organization ability and capacity to deal with and develop in mission, competition, performance and change.

The information can be categorized on the basis of its requirement by the top, middle and lower level management.

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, 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, whereas the lower level managers are superintendents, supervisor, etc.

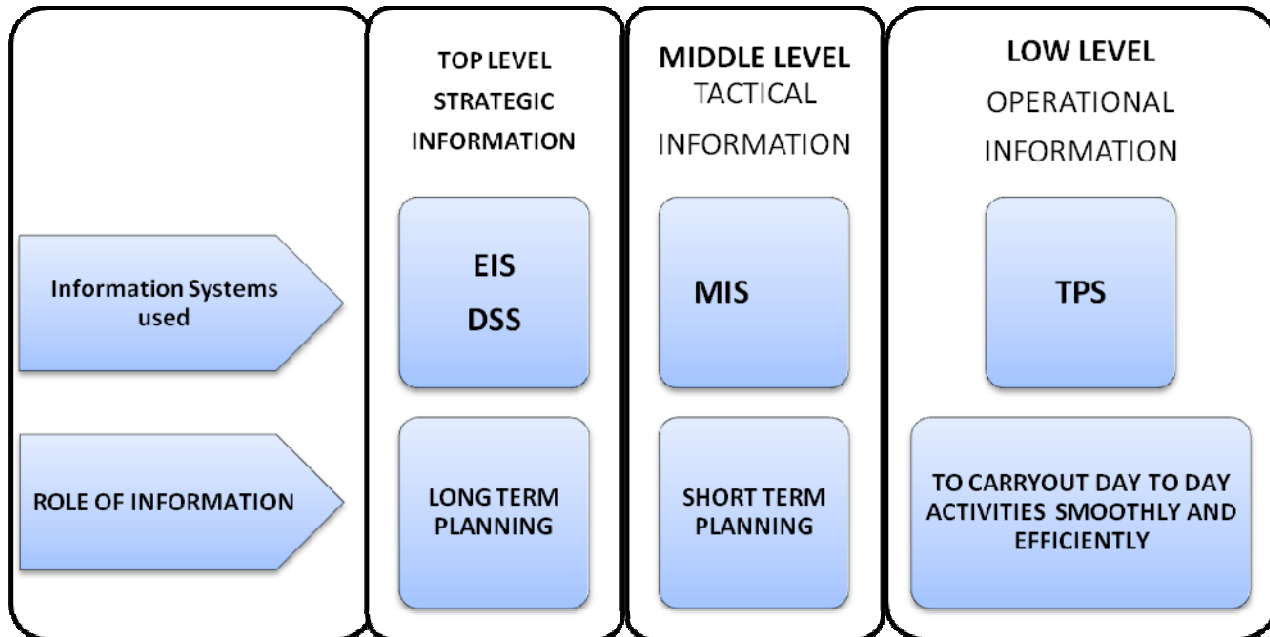


Fig. 2.3.1: Types of Information Systems at Different Management Levels

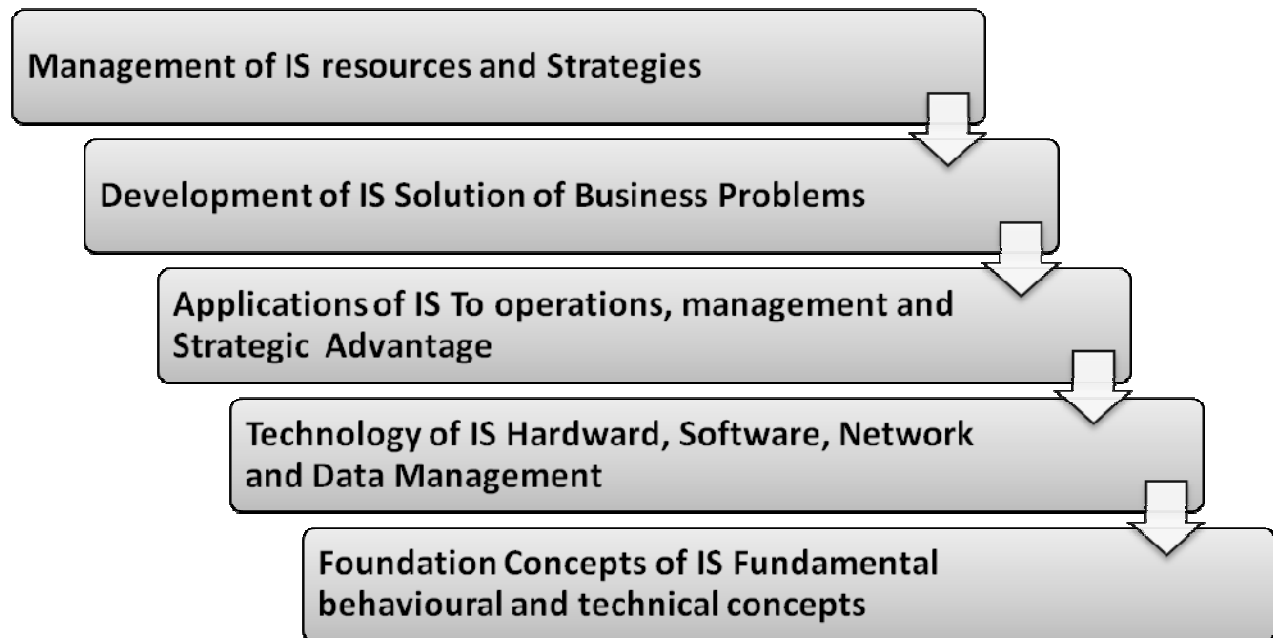
2.4 Relative Importance of Information Systems from Strategic and Operational Perspectives

There are different kinds of systems depending upon the different interest, specialties and levels in an organization. The organization comprise of strategic, management, knowledge and operational levels, which is further divided into functional areas e.g. sales, marketing, manufacturing, finance, accounting and human resources. Different information systems that serve different organizational levels are given as follows:

- (i) **Operational Level Systems-** This supports operational managers by keeping track of the elementary activities and transactions of the enterprises e.g. sales, payroll, receipts etc. These are primarily needed to answer routine questions and keep track of flow of transactions though the enterprises. For example- it gives answer to query like how many books are in the inventory, what happens to the payment of the customer? And how many hours a particular employee works in office. To get answer of these types of queries the information should be accurate, current and easily available.
- (ii) **Knowledge Level Systems-** This type of system support the business to integrate new knowledge into the business and control the flow of paperwork. It helps the organization's knowledge and data workers and is especially in the form of workstations. It is the fastest growing application in business today.
- (iii) **Management Level Systems-** It supports the middle managers in monitoring, decision-making and administrative activities. This is helpful in answering questions like are things working well and in order? 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. This type of systems mainly answer "what if" questions. For example-What would be quality of teaching if college has to achieve top ranking in academics? These types of questions can be answered only after getting new data from outside the organization, as well as data from inside which cannot be easily obtained from existing operational level systems.
- (iv) **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. It answers questions like what products should be launched to increase the profit and capture the market. It helps in long term planning.

Managers or business professionals are not required complete understanding of complex technologies, concepts and the specialized applications in the area of information systems but what they should know is illustrated in Fig. 2.4.1. This outlines five key areas of knowledge requirements, which are given below:

- Foundation concepts,
- Information technologies,
- Business applications,
- Development processes, and
- Management challenges.



FRAMEWORK OF INFORMATION SYSTEMS FOR BUSINESS PROFESSIONALS

2.5 Various types of Business Applications

In this topic, we focus on the different types of business and enterprises where information systems and IT are popular.

The Accounting Information System

The key steps of a typical accounting information system are given as follows:

- Work steps within a business process intended to capture accounting data;
- The manual or computer-based records to record the accounting data;
- Work steps that are internal controls;
- Work steps to process, classify, summarize, and consolidate the raw accounting data; and
- Work steps that generate both internal and external reports.

The impact of IT on information systems for different sectors is explained below:

(i) **E-business** – This is also called electronic business and includes purchasing, selling, production management, logistics, communication, support services and inventory management through the use of internet technologies. The advantage of E-business are 24 hour sale, lower cost of doing business, more efficient business relationship, eliminate middlemen, unlimited market place and access with broaden customer base, secure payment systems, easier business administration and online fast updating. This is so because it does not require land for store or shops and anyone from anywhere can do business anytime as information regarding products etc. are available on the web. Only investment needed in the purchase of space on internet, designing and maintenance of website. Different types of business can be done e.g. it may be **B2B (Business to Business), B2C (Business to Customer), C2C (Customer to Customer) and C2B (Customer to Business)**. Because of no limitations of time and space, people prefer to involve in E-business. Thus, we can say that IT has given new definition to business.

(ii) **Financial Service Sector** –Owing to application of IT, all the major financial institutions operate nationally and have wide networks of regional offices and associated electronic networks. The associated substantial client databases are handled via **large central mainframe systems** that characterize the industry. Now-a-days most of the services are offered by the financial services on internet, which can be accessed from anywhere and anytime that makes it more convenient to the customers.

(iii) **Wholesaling and Retailing** –Retail business uses IT to carry out basic functions including till systems for selling items, capturing the sales data by item, stock control, buying, management reports, customer information and accounting. The laser scanners used in most grocery supermarkets and superstores to read product bar codes are among the most distinctive examples of modern computer technology. By using internet or mobile phones retailers can collect and exchange data between stores, distribution centers, suppliers and head offices.

Public sectors – It includes services provided by the government mainly hospitals, police stations, universities etc. IT/IS can be used here, to keep records of the cases, respective people involved it, other related documents and can consult the existing data warehouse or databases to take appropriate actions.

(iv) **Others** – IT is efficiently used in entertainment industry (games, picture collection etc.), agriculture industry (information is just a mouse click away to the farmers), Tour industry (railway, hotel and airline reservations) and consultancy etc.

Thus, we can say that IT has changed the working style of business world drastically and make it simpler day-by-day with its advancement.

2.6 Overview of Underlying IT Technologies

Now day's business uses IT to carry out basic functions including systems for selling items, capturing the sales data by item, stock control, buying, management reports, customer information, decision making, accounting etc. Here, we discuss some of the **IT tools crucial for business growth**.

(i) **Business Website** – By having a website, enterprise/business becomes reachable to large amount of customers. In addition, it can also be used in an advertisement, which is cost effective and in customer relationship management. T

(ii) **Internet and Intranet** – It is the best source of communication. Time and space is no more obstacles for conducting meeting of people working in a team from multiple locations, or with different vendors and companies.

Intranet is system that permits the electronic exchange of business data within an organization, mostly between managers and senior staff. E-commerce among partners (suppliers, wholesalers, retailers, distributors) using intranets, e-mail etc. provides new platform to the business world for conducting business in a faster and easier way. E-commerce provides business to business, business to customer, customer to customer and customer to business communication with a click of mouse.

(iii) **Software and Packages** – DBMS, data warehousing, data mining tools, knowledge discovery can be used for getting information that plays important role in decision making that can boost the business in the competitive world. e.g. by having information of buying habits of customer, sales of product; marketing strategy can be built quickly and effectively with the use of data mining tools and knowledge discovery in database (KDD). These can be used in Supply chain logistics, including planning, purchasing, replenishment, logistics, and space management.

Business Intelligence (BI) refers to applications and technologies that are used to collect provide access and analyze data and information about companies operations. BI software consists of range of tools. Some BI applications are used to analyze performance or internal operations e.g. EIS (executive information system), business planning, finance and budgeting tools. While others are used to store and analyze data e.g. Data mining, data warehouses, Decision support system etc. Some BI applications are also used to analyze or manage the human resources e.g. customer relationship and marketing tools. A complete BI provides consistent and standard information essential in enterprise operations.

Enterprise Resource Planning (ERP) Packages

(iv) **Computer Systems, Scanners, Laptop, Printer, Webcam, Smart Phone etc.-**

Webcam, microphone etc. are used in conducting long distance meeting. Use of computer systems, printer, and scanner increases accuracy, reduce processing times, enable decisions to be made more quickly and speed up customer service. For example, one can charge accurate prices and eliminates the need to apply price labels to individual items by the use of scanning system.

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Write me to **Krishnapanigrahi@gmail.com**