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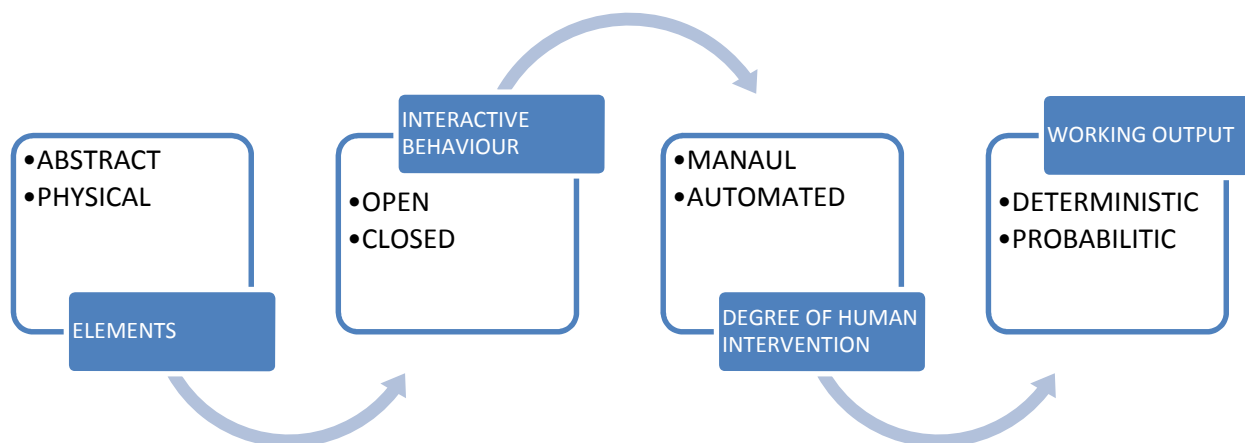
INFORMATION SYSTEM CONCEPTS

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. Input is the data entering the system. Processing is the manipulation of the input data. Output is the data/instruction given by the system after processing and storage refers to the storage of data for current or future use.

2.2. Classification of System

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



- 1) **Elements: Abstract System** also known as **Conceptual System or Model** can be defined as an orderly arrangement of interdependent ideas or constructs. **Physical system** is a set of tangible elements, which operated together to accomplish an objective e.g. Computer system.
- 2) **Interactive behavior: Open system** interacts with other systems in its environment **Closed system** does not interact with the environment and does not change with the changes in environment. Information system is an open system & a 'throw-away' type sealed digital watch composed of a number of components this watch is a closed system as it is completely isolated from its environment for its operation.
- 3) **Degree of human intervention: 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**.
- 4) **Working/output: deterministic system** operates in a predictable manner whereas **probabilistic system** can be defined in terms of probable behavior. For example; software & inventory system.

2.3. Computer Based Information System:

A computer based Information system is a combination of people, IT and business processes that helps management in taking important decisions to carry out the business successfully. An information system comprise of people, hardware, software, data and network for communication shown in Fig

COMPONENTS OF IS			
PEOPLE	COMUTER SYSTEM	DATA	NETWORK

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An information system model comprises of following steps

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

Three basic activities of an information system help enterprise in making decisions, control operations, analyze problems and create new products or services. Apart from these activities, information systems also need feedback, which is to evaluate at the input stage.

2.4. Characteristics of computer based information systems are given as follows:

- 1) All systems work for predetermined objectives and the system is designed and developed accordingly.
- 2) 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.
- 3) 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'.
- 4) 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.
- 5) The work done by individual subsystems is integrated to achieve the central goal of the system. The goal of individual subsystem is of lower priority than the goal of the entire system.

2.5. Major areas of computer based applications are

- 1) **Finance and Accounting** – The main goal of this subsystem is to ensure the financial viability of the organization, enforce financial discipline and monitor the financial budget. It also helps in forecasting revenues, determining the best resources and uses of funds and managing other financial resources.
- 2) **Marketing and Sales** – Marketing and sales activities have a key role for running a business successfully in a competitive environment. The objective of this subsystem is to maximize the sales and ensure customer satisfaction.
- 3) **Production or Manufacturing** – The objective of this subsystem is to optimally deploy man, machine and material to maximize production or service. The system generates production schedules and schedules of material requirements, monitors the product quality.
- 4) **Inventory Management**- The inventory management system is designed with a view to keeping the track of materials in the stores. The system is used to regulate the maximum and minimum level of stocks, raise alarm at danger level stock of any material.
- 5) **Human Resource Management**- Human resource is the most valuable asset for an organization. Effective and efficient utilization of manpower is a key functional area ensures to facilitate disruption free and timely services in business. Human resource management system aims to achieve this goal. Skill database maintained in HRM system, with details of qualifications, training, experience, interests etc. helps management for allocating manpower to right activity at the time of need or starting a new project.

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2.6. TYPES OF INFORMATION SYSTEM

OPERATION SUPPORT SYSTEM (OSS)	MANAGEMENT SUPPORT SYSTEM	OFFICE AUTOMATION SYSTEM
• TPS • PCS • ECS	• MIS • DSS • EIS	• TPS • EDMS • EMCS • TVCS

2.7. Operations Support Systems (OSS)

Required to process the data generated and used in business operations. OSS produces a variety of information for internal and external use. The main objective of OSS is to improve the operational efficiency of the enterprise.

1) Transaction Processing Systems (TPS)

At the lowest level of management, TPS is an information system that manipulates data from business transactions. Any business activity 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:

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

A TPS may follow the periodic data preparation and batch processing or on-line processing. However, in industries and business houses, now-a-days on-line approach is preferred in many applications as it provides information with up-to-date status.

b) TPS COMPONENTS

- i) **Inputs** – Source documents, are the physical evidence of inputs in to the Transaction Processing System. They serve several purposes like capturing data, facilitating operations by communicating data and authorizing another operation in the process, standardizing operations by indicating, which data require recording and what actions need to be taken.
- ii) **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.
- iii) **Storage** – Ledgers and files provide storage of data on both manual and computerized systems.
- iv) **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.

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c) FEATURES OF TPS

- i) **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.
- ii) **Automation of basic operations-** 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.
- iii) **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. Therefore, cost benefit analysis regarding the desirability of TPS is easy to conduct.
- iv) **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.

2) PROCESS CONTROL SYSTEM (PCS)

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.

3) 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.

2.8. 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.

1) MANAGEMENT INFORMATION SYSTEMS (MIS)

MIS has been defined by Davis and Olson as “An integrated user-machine system designed for providing information to support operational control, management control and decision making functions in an organization”. 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.

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. MIS at the top level is much more comprehensive but is condensed or summarized compared to the information provided to those at middle level management. MIS provide reports to management that can help in making effective.

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a) Characteristics of an effective MIS

- i) **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
- ii) **Management Directed** – Because of management orientation 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.
- iii) **Integrated** – The best approach for developing information systems is the integrated approach. An integrated Information system has the capability of generating more meaningful information to management as it takes a comprehensive view
- iv) **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. Afterwards, they try to utilize a minimum of data processing procedures and sub-systems to process the data and strive to minimize the number of output documents and reports produced by the system.
- v) **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
- vi) **Sub System Concept** – Even though the information system is viewed as a single entity, it must be broken down into digestible sub-systems. The breaking down of MIS into meaningful sub-systems sets the stage for this phasing plan.
- vii) **Common Database** – It is defined as a "super-file", which consolidates and integrates data records formerly stored in many separate data files. 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.
- viii) **Computerized** – Though MIS can be implemented without using a computer; the use of computers increases the effectiveness of the system. In fact, its use equips the system to handle a wide variety of applications by providing their information requirements quickly.

b) MISCONCEPTIONS ABOUT MIS

- i) Any computer based information system is a MIS.
- ii) Any reporting system is MIS.
- iii) MIS is a management technique.
- iv) MIS is a bunch of technologies.
- v) MIS is an implementation of organizational systems and procedures.
- vi) The study of MIS is about use of computers.
- vii) More data in generated reports refers more information to managers.
- viii) Accuracy plays vital role in reporting.

c) PRE-REQUISITES OF AN EFFECTIVE MIS

- i) **Database** - It is collection of files, which is collection of records and records are nothing but collection of data. The data in database is organized in such a way that accessing to the data is improved and redundancy is reduced.

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The main characteristics of database are given as follows:

- (1) It is user-oriented.
 - (2) Capable of being used as a common data source to various users to help in avoiding duplication of efforts in storage and retrieval of data and information.
 - (3) Available to authorized persons only.
 - (4) Controlled by a separate authority established for the purpose (DBMS).
- ii) Qualified System and Management Staff** – MIS should be manned by qualified officers. For this, the organizational management base should comprise of two categories of officers; Systems and Computer experts and Management experts.
- iii) 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.
- iv) 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.
- v) Support of Top Management** – The support from top management is required for the effectiveness of MIS in an organization. The reasons for the same are as follows:
- (1) Any implementation which does not receive the support of top management will not be effectively controlled and tends to be given lesser priority and may be delayed or abandoned.
 - (2) The resources involved in computer-based information systems are large and are growing larger in view of importance gained by management information system.
 - (3) 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.
- vi) 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. Maintenance is closely related to control. Formal methods for changing and documenting changes must be provided

d) EVALUATION OF MIS

An effective MIS should be capable of meeting the information requirements of its executives in future as well. This capability can be maintained by evaluating the MIS and taking appropriate timely action. The evaluation of MIS should take into account the following major points.

- i) Enough flexibility** exists in the system to cope with any expected or unexpected information requirement in future
- ii) Ascertain Capabilities and deficiencies** of the system.
- iii) Steps to be taken to maintain effectiveness** of MIS.

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e) CONSTRAINTS IN OPERATING A MIS

- i) **Non-availability of experts**, who can diagnose the objectives of the organization and provide a desired direction for installing operating system.
- ii) **Problem of selecting the sub-system** of MIS to be installed and operated upon.
- iii) **Due to varied objectives of business concerns**, the approach adopted by experts for designing and implementing MIS is a non-standardized one.
- iv) **Non-availability of cooperation from staff** is a crucial problem, which should be handled tactfully.

f) LIMITATIONS OF MIS

- i) The **quality of the outputs** of MIS is basically governed by the **quantity of input** and processes.
- ii) 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.
- iii) MIS may not have requisite **flexibility** to quickly update itself with the changing needs of time, especially in fast changing and complex environment.
- iv) MIS **cannot provide tailor-made information packages** suitable for the purpose of every type of decision made by executives.
- v) 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.
- vi) 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.
- vii) The **effectiveness** of MIS is reduced in enterprises, where the **CULTURE OF HOARDING** information and not sharing with other holds.
- viii) MIS **effectiveness decreases** due to frequent **changes in top management**, organizational structure and operational team.

2) DECISION SUPPORT SYSTEM (DSS)

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

- i) This supports decision making and occurs at all levels of management.
- ii) Instead of helping individuals working on independent tasks, it should be able to help group making decisions
- iii) It should be flexible and adaptable.
- iv) Focuses on decision rather than data and information.
- v) It should be easy to use.

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- vi) Can be used for structured problems.
- vii) Should be user-friendly.
- viii) Should be extensible and evolve overtime.
- ix) DSSs are used mainly for decision making rather than communicating decisions and training purposes.
- x) 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

- i) **The user-** The user of a DSS is usually a manager with an unstructured or semi-structured problem to solve. Manager and staff specialist (analyst) are the two broad classes of users.
- ii) **Manager-** These are the users, who have basic computer knowledge and want the DSS to be very user friendly.
 - (1) **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. The data from external sources include data about the operating environment of an organization.

Implementation of database at three levels as listed below

- (1) **Physical level** – It involves the implementation of the database on the hard disk
 - (2) **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.
 - (3) **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.
- ii) **Planning languages** Two types of planning languages that are commonly used in DSS are:
- (1) **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.
 - (2) **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.
- iv) **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. There are many types of model bases, but most of them are custom-developed models that do some types of mathematical functions, for example; cross tabulation, regression analysis, time series analysis.

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b) 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.

- i) **Cost Accounting System-** The health care industry is well known for its cost complexity. Managing costs in this industry require controlling costs of supplies, expensive machinery, technology, and a variety of personnel. Cost accounting applications help health care enterprises calculate product costs for individual procedures or services.
- ii) **Capital Budgeting System-** Companies require new tools to evaluate high- technology investment decisions. Decision makers need to supplement analytical techniques, such as net present value and internal rate of return, with decision support tools that consider some benefits of new technology not captured in strict financial analysis.
- iii) **Budget Variance Analysis System-** Financial institutions rely heavily on their budgeting systems for controlling costs and evaluating managerial performance. One institution uses a computerized DSS to generate monthly variance reports for division comptrollers. The system allows these comptrollers to graph, view, analyze, and annotate budget variances, as well as create additional one-and five-year budget projections using the forecasting tools provided in the system.
- iv) **General Decision Support System-** Some planning languages used in decision support systems are general purpose and therefore have the ability to analyze many different types of problems. In a sense, these types of decision support systems are a decision-maker's tools. The user needs to input data and answer questions about a specific problem domain to make use of this type of 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

3) 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.

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a) CHARACTERISTICS OF EIS

- i) It is Computer-based-information system that serves the information need of top executives.
- ii) Enables users to extract summary data and model complex, problems without the need to learn query languages statistical formulas or high computing skills.
- iii) Provides rapid access to timely information and direct access to management reports.
- iv) Capable of accessing both internal and external data.
- v) Provides extensive online analysis tool like trend analysis, market conditions etc.
- vi) 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. 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.

Characteristics of the types of information used in executive decision making are given as follows

- i) **Lack of structure** – Many of the decisions made by executives are relatively unstructured. These types of decisions are not as clear-cut as deciding how to debug a computer program or how to deal with an overdue account balance.
- ii) **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.
- iii) **Future orientation** – Strategic 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.
- iv) **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.
- v) **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.

b) CONTENTS OF EIS

A general answer to the question of 'what data is appropriate for inclusion in an Executive Information System' is "whatever is interesting to executives". EIS implementations begin with just a few measures that are clearly of interest to senior management and then expand in response to questions asked by those managers as they use the system.

c) A set of principles to guide the design of measures and indicators to be included in an EIS

- i) 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.
- ii) 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.

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- iii) 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.
- iv) 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.
- v) 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.
- vi) 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	Specific issues/problems and aggregate reports	Status reporting
Nature of information provided	Online tools and analysis	Offline status reporting
Information Sources	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

2.9. OFFICE AUTOMATION SYSTEMS (OAS)

The application of computers to handle the office activities is also termed as office automation. It is most rapidly expanding computer based information systems & can be broadly grouped into the following types of operations:

- Document Capture
- Document Creation
- Receipts and Distribution
- Filling, Search, Retrieval and Follow up
- Calculations
- Recording Utilization of Resources

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1) Benefits of Office Automation Systems

- a) Communication within an organization and between enterprises.
- b) Reduce the cycle time between preparation of messages and receipt of messages at the recipients' end.
- c) Reduce the costs of office communication both in terms of time spent by executives and cost of communication links.
- d) Ensure accuracy of information and smooth flow of communication.

2) Computer based Office Automation Systems

a) Text Processing Systems

- i) Text processing systems are the most commonly used components of the OAS. This is so because a large proportion of the office communication takes place in writing using words of a natural language.
- ii) Text processing systems automate the process of development of documents such as letters, reports, memos etc.
- iii) They permit use of standard stored information to produce personalized documents.
- iv) Reduces keying effort and minimizes the chances of errors in the document.
- v) The text processor may be simple word processing systems or desktop publishing systems.
- vi) The desktop publishing systems are often supported with laser printers, inkjet printers, scanners for producing good quality documents.

b) Electronic Document Management System

- i) Capture the information contained in documents, stored for future reference and make them available to the users as and when required. These systems are linked to the office automation systems such as text processors, electronic message communication systems etc.
- ii) These systems are very useful in remote access of documents that is almost impossible with manual document management systems,
- iii) In the case of internal communication, document management systems can prove to be very useful.
- iv) With computer based document management systems, location of the executive becomes irrelevant for access to documents.

c) Electronic Message Communication Systems

Business enterprises have been using a variety of communication systems for finding and receiving messages. These include telephone, mail and facsimile (Fax), etc. 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.

3) Components of Message Communication Systems

a) Electronic Mail

- i) **Electronic Transmission-** The transmission of messages with email is very quick, almost instantaneous. The confirmation of transmission is also quick and the reliability is very high.
- ii) **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.
- iii) **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.
- iv) **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.

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- v) **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.
 - vi) **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.
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- b) **Facsimile (Fax)** – It is electronic communication of images of documents over telephone lines. 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. The use of fax is gradually fading away with more and more use of electronic communication through emails.
 - 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.
 - d) **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 of meeting. Teleconferencing may be audio or video conferencing with or without use of computer systems.
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- 4) **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. Investment portfolio management.
 - b) **Business applications of Expert Systems are:**
 - i) **Accounting and Finance**- It provides tax advice and assistance, helping with credit-authorization decisions, selecting forecasting models, providing investment advice.
 - ii) **Marketing**- It provides establishing sales quotas, responding to customer inquiries, referring problems to telemarketing centers, assisting with marketing timing decisions, determining discount policies.
 - iii) **Manufacturing**- It helps in determining whether a process is running correctly, analyzing quality and providing corrective measures, maintaining facilities, scheduling job-shop tasks
 - iv) **Personnel**- It is useful in assessing applicant qualifications, giving employees assisting at filling out forms.
 - v) **General Business**- It helps in assisting with project proposals, recommending acquisition strategies, educating trainees, evaluating performance.

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c) Need for Expert Systems

- i) **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.
- ii) No matter how bright or knowledgeable certain people are, they often can handle only a **few factors** at a time.
- iii) Both these limitations put a practical limit on the quality of human decision making this putting a need for expert systems.

d) Benefits of Expert Systems

- i) **Preserve knowledge** that might be lost through retirement, resignation or death of an acknowledged company expert.
- ii) **Put information into an active-form** so it can be summoned almost as a real-life expert might be summoned.
- iii) **Assist trainees** in thinking the way experienced professional do.
- iv) Are **not subjected** to such human fallings as **fatigue**, being too busy, or being emotional.
- v) Can be effectively **used as a strategic tool** in the areas of marketing products, cutting costs and improving products

e) Properties of Expert System

- i) **Availability** – One or more experts are capable of communicating ‘how they go about solving the problems to which the Expert System will be applied.
- ii) **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.
- iii) **Domain** – The domain, or subject area, of the problem is relatively small and limited to a relatively well-defined problem area.
- iv) **Expertise** – Solutions to the problem require the efforts of experts. That is, only a few possess the knowledge, techniques, and intuition needed.
- v) **Structure** – The solution process must be able to cope with ill-structured, uncertain, missing, and conflicting data, and a dynamic problem-solving situation.

5) KNOWLEDGE MANAGEMENT SYSTEMS

- a) These are knowledge based systems that support the conception, association and propagation of business knowledge within the enterprise.
- b) **Functional Business Information Systems** - These systems supports the operational and managerial applications of the basic enterprises of an industry.
- c) **Strategic Information Systems** - These systems provide an industry strategic products, services and capabilities for competitive advantage.

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6) Different Information Systems

Information System	Description
Management Information Systems (MIS)	It is mainly concerned with internal sources of information. It inputs data usually from the transaction processing systems and gives output as a series of management reports. MIS reports can be used by middle management and operational supervisors to gather desired information.
Decision Support Systems (DSS)	These are specifically designed to help management to make decisions in situations where there is uncertainty about the possible outcomes of those decisions. DSS consists of tools and techniques that gather relevant information and helps in analysis of the options and alternatives. It usually uses complex spread sheet and databases to generate information.
Knowledge Management Systems (KMS)	These help businesses in creation and sharing of information and are typically used in a business where employees create new knowledge and expertise, which can then be shared by other people in the enterprise to create further commercial opportunities. For example, KMS are most effectively used in firms of lawyers, accountants and management consultants. One can say that these are effective in systems, which allow efficient categorization and distribution of knowledge. For example, Knowledge discovery in database and Data mining tools can be used to extract the knowledge from word processing documents, spread sheets.
Transaction Processing Systems (TPS)	These are designed to process and carry out routine transactions efficiently and accurately. A business will have several TPS. For example, Billing systems and invoices to customers, to calculate the weekly and monthly payroll and tax payments of an organization, to calculate raw material requirements, stock control systems to process all movements into, within and out of the business etc.
Office Automation Systems	These are systems that help in the enhancement of performance of or productivity of employees who are dealing with the data processing and information. For example, the use of MS-Office can generate the list of customers who have done purchase of certain type of products, number of sales of products done on a particular date etc.

7) Application of Information Systems in Enterprise Processes

- a) Support an organization's business **processes and operation**: This includes operations support systems such as Transaction Processing Systems, Process Control Systems
- b) Support business **decision-making**: This includes Management Information Systems, Decision Support Systems, and Executive Information Systems
- c) 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:

- a) **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'.

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- b) **Information Technologies (IT)** – It includes operation, development and management of hardware, software, data management, networks, and other technologies.
 - c) **Business Applications** – It includes major uses of IT in business steps i.e. processes, operations, decision making, and strategic/competitive advantage.
 - d) **Development Processes** – It comprise how end users and IS specialists develop and execute business/IT solutions to problems.
 - e) **Management Challenges** – It includes ‘how the function and IT resources are maintained’ and utilized to attain top performance and build the business strategies.
- 8) **Important implications of information systems in business:**
- a) Helps managers in efficient decision-making to achieve the organizational goals.
 - b) An organization will be able to survive and thrive in a highly competitive environment on the strength of a well-designed Information system.
 - c) Information systems helps in making right decision at the right time.
 - d) good information system may help in generating innovative ideas for solving critical problems.
 - e) Knowledge gathered through Information system may be utilized by managers in unusual situations.
 - f) Information system is viewed as a process; it can be integrated to formulate a strategy of action or operation.

2.10. Information

Information means processed data. Data is facts or values of results, and information is the relations between data and other relations. e.g. student name, roll number and marks obtained

1) Attributes of Information:

- a) **Availability-** Information is useless if it is not available at the time of need.
- b) **Purpose/Objective-** Information must have purposes/objective at the time it is transmitted to a person or machine, otherwise it is simple data. The basic objective of information is to inform, evaluate, persuade, and organize.
- c) **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 also plays an important role in communicating the idea. It should be designed in such a way that it assists in decision making, solving problems, initiating planning, controlling and searching.
- d) **Current/Updated-**The information should be refreshed from time to time as it usually rots with time and usage. For example, the running score sheet of a cricket match.
- e) **Rate-** The rate of transmission/reception of information may be represented by the time required to understand a particular situation. 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
- f) **Frequency-** The frequency with which information is transmitted or received affects its value. For example- the weekly reports of sales
- g) **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& their marks
- h) **Reliability-** It is a measure of failure or success of using information for decision-making.

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- i) **Validity**- It measures how close the information is to the purpose for which it asserts to serve.
- j) **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.
- k) **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.
- l) **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.

2) Role of Information in Business

In today's dynamic business environment, it becomes mandatory to have complete information and knowledge of customer buying habits and market strategy for any enterprise. 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

- a) Top level management strives for the information that can help them in major policy decisions such as establishment of new plant, launching of new product etc.
- b) Middle managements require tactical information that helps in implementing decisions taken by the top management. For example: information of customers likely to purchase certain product in a particular location can help sales managers to fulfill their sales target efficiently.
- c) The lower management requires operational information, which is required in day-to-day activities. The operational information mainly comprises of information about stock on hand, information about customer order pending, information about bill payable by customer etc.

3) 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 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.

There are different kinds of systems depending upon the different interest, specialties and levels in an organization.

- a) **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. For example- how many books are in the inventory, what happens to the payment of the customer?
- b) **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.

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- c) **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. 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?
- d) **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. This outlines five key areas of knowledge requirements, which are given below:

- i) Foundation concepts,
- ii) Information technologies,
- iii) Business applications,
- iv) Development processes, and
- v) Management challenges.

4) The Accounting Information System

The accounting information system comprises of the processes, procedures, and systems that capture accounting data from business processes; record the accounting data in the appropriate records; process the detailed accounting data by classifying, summarizing and consolidating the report the summarized accounting data to internal and external users.

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

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

5) The impact of IT on information systems for different sectors

- a) **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 primary components of E-business are infrastructure (computers, routers, and communication media).
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. Different types of business can be done e.g. it may be B2B, B2C, C2C and C2B. 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.
- b) **Financial Service Sector** – The financial services sector manages large amounts of data and processes enormous numbers of transactions every day. The associated substantial client databases are handled via large central mainframe systems that characterize the industry. IT has changed the working style of financial services and makes them easier and simpler for customers also. 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

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the customers. It has been observed that automated and IT enabled service sectors reduces cost effectively. Through the use of internet and mobile phones financial service sectors are in direct touch with their customers and with adequate databases it will be easier for service sectors to manage customer relationships. For example, emails or SMS

- c) **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.

6) Overview of Underlying IT Technologies

- a) **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. These websites can be designed by using HTML, XML, and ASP. NET etc.
- b) **Internet and Intranet** – Internet 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.

- c) **Software and Packages** – DBMS, data warehousing, and data mining tools 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).
- d) **Business Intelligence (BI)** refers to applications and technologies that are used to collect, provide access and analyze data and information about companies operations. Some BI applications are used to analyze performance or internal operations e.g. EIS, 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.

2.11. Enterprise Resource Planning (ERP) Packages

An ERP System is a multi-module software system that integrates all business process and functions of the entire Enterprise into a single software system, using a single integrated database. Each module is intended to collect, process, and store data of a functional area of the organization and to integrate with related processes. For example, a module may be designed to process purchasing transactions and record all data about purchase orders. This module must integrate with accounts payable and inventory, since the vendor must be paid and inventory increased as the purchased goods arrive. Each of the software modules of an ERP system automates business activities of a functional area within an organization. Information is updated instantly using the same database and each functional area can easily share information with other areas of the organization as data is input once and processed as required and also linked to all related processes and made available for users as required.

Data Mining (DM) can be applied in database analysis and decision support i.e. market analysis and management by finding patterns that are helpful in target marketing, customer relation management,

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market basket analysis, cross selling, market segmentation, risk analysis, customer retention, improved underwriting, quality control, competitive analysis and fraud detection. Other applications of DM are

Text mining, web analysis, Customer profiling, Identifying customer requirements, Provide summary information, finance planning and asset evaluation, cross-sectional and time series analysis, and resource planning- it can summarize and compare the resources and spending.